# The Foundry


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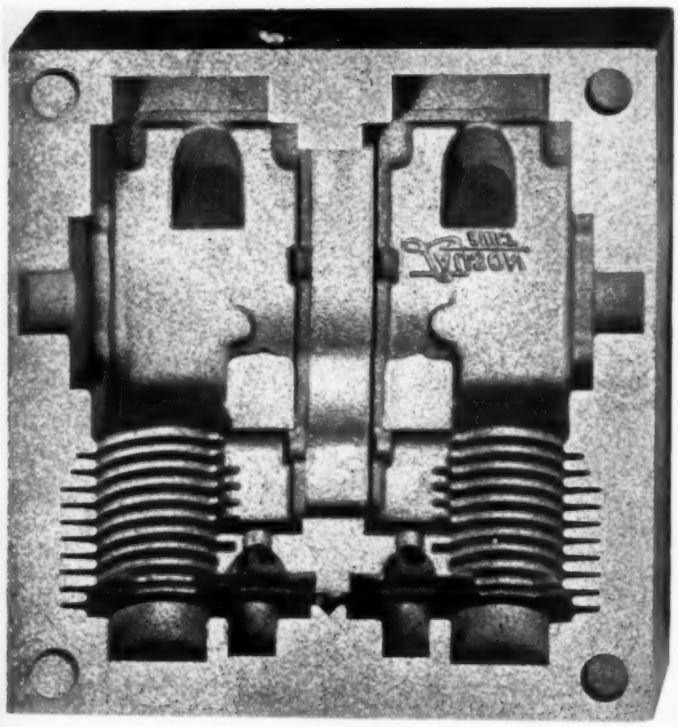
**VOLUME 66** **NUMBER 10**



| | PAGE |
|---|---|
| Editorial | 21 |
| Duplexing Malleable Cast Iron<br>*By George A. Schumacher* | 22 |
| Ventilation Solves Foundry Problem<br>*By Edwin Bremer* | 25 |
| Patterns Must Be Good<br>*By Vaughan Reid* | 26 |
| Core Making in the Brass Foundry<br>*By N. K. B. Patch* | 29 |
| Progress in Automotive Steel Castings<br>*By R. H. McCarroll* | 30 |
| Trains Run on Chilled Car Wheels<br>*By Pat Dwyer* | 32 |
| Among Detroit Foundries<br>*By A. H. Allen* | 34 |
| Questions and Answers | 36 |
| Men of Industry | 40 |
| Readers' Comment | 42 |
| Poland Is Host to Foundrymen<br>*By Vincent Delport* | 44 |
| The Adventures of Bill<br>*By Pat Dwyer* | 46 |
| Three Chapters to Hold Conferences | 52 |
| Activities of Foundry Groups | 58 |
| Viewing Foundry Developments at Short Range | 63 |
| Chicago Foundry Makes Large Castings<br>*By W. G. Gude* | 65 |
| Discuss Wide Range of Topics at Michigan Conference | 66 |
| Obituary | 92 |
| New Equipment and Supplies | 94 |
| Foundry Activities | 100 |
| New Trade Publications | 102 |



# *Once again*

## *Supt. Oscar Dumke at Hand after*

*Cores, Castings, Letter,*

*by*

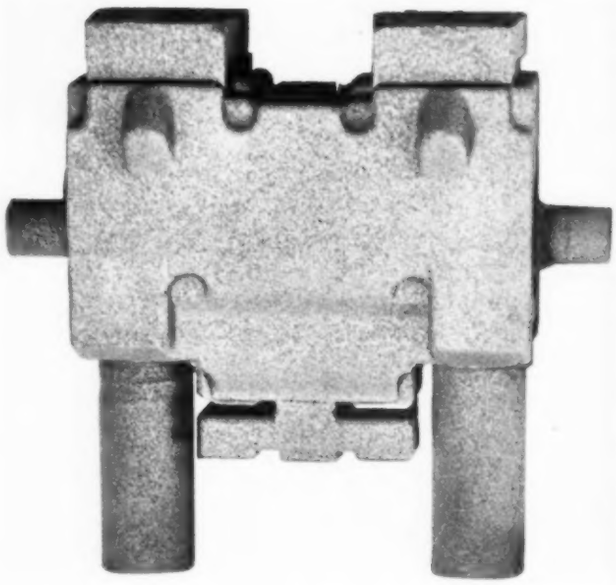
**THE LAUSON COMPANY**

New Holstein,
Wisconsin

"Sometime ago we ran into a great deal of trouble caused by soft cores, and cores with other defects. After going through a number of months of experimentation on core oils furnished us by at least half a dozen different manufacturers and in several instances core oils of the same manufacture made up to take care of our special problem, your representative called here and after discussing our core oil problems, he suggested that we try some of your regular Linoil which we did at that time and have been using ever since.

**"We are well pleased with Linoil, the way it works, the results it gives, and can recommend its use to any foundryman.**

THE LAUSON COMPANY,
Oscar Dumke, Foundry Supt."



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# The Foundry Editorial

## Wages, Hours Law Procedure Developing Slowly

WHILE the *Fair Labor Standards Act of* 1938, better known as the *Wages and Hours Law,* becomes effective Oct. 24, the general procedure of administration as yet has not been determined completely. Certain trends are indicated in the work already done, but Elmer F. Andrews, administrator of the wages and hours division of the department of labor has moved slowly in adopting detailed administration regulations.

The first industry committee, covering the textile industry was appointed the second week in September at the request of both employers and employes. Although the administrator has explained that the organization of the first committee necessarily does not establish a precedent for future regulations, a brief study of the textile committee program should prove interesting to the foundry industry.

That committee, composed of 21 members representing employer, employe and the public, first will collect data regarding wage conditions in the industry and then will recommend a minimum wage schedule for the industry. While the method of collecting the information will be determined by the committee, it is probable that the investigation will include hearings at points convenient to business and the labor groups affected. The administrator will hold hearings of interested parties, following receipt of recommendations of the committee, and then may make the recommendations effective by a minimum wage order, refer them back to the same committee for another recommendation, or appoint a new committee. The administrator must base all wage orders upon recommendations of an industry committee.

Methods to be followed in the foundry industry still are matters of conjecture. Based on information now available, it seems probable the various trade associations heading three branches of the foundry industry will be called upon by the administrator to assist in the appointment of committees. Therefore, each trade association should have the complete backing of every plant in the particular branch. All necessary information, requested by the trade associations, should be supplied promptly by the individual company. Much should be gained through complete co-operation.

When the complicated machinery required to administer the wages and hours law finally is in full operation, there can be no doubt that every foundry will be affected to some degree. Until an industry committee recommends a minimum wage schedule, and the administrator makes certain interpretations, as for example in the matter of exemptions, the influence on the foundry industry cannot be judged.

## Auto Has More Cast Parts

THE article on "Progress in Automotive Cast Steels" by R. H. McCarroll, presented on page 30 of this issue of THE FOUNDRY, should provide an inspiration for everyone connected with the foundry industry. At the same time, the discussion should go far in silencing the would be sages who rise now and then to herald the end of the foundry industry.

Mr. McCarroll has outlined briefly the relatively recent developments of the Ford Motor Co. in producing and utilizing both steel and gray iron castings for automotive parts, formerly manufactured from other metals and by other methods of fabrication. The record of accomplishment is astounding.

Since 1931 that company has started to use steel castings for valves, crankshafts, valve seats, wheel hubs and pistons, and also has adopted alloy iron castings for push rods and camshafts. Statistics provide the best indications of the importance of these changes in design and materials. To meet only the needs for these particular castings during the varying periods since they were adopted, the Ford company has produced a total of 182,250,000 castings weighing 231,270 tons.

The end of this development of cast products for the automobile is not in sight. While the Ford company is installing equipment to cast gears centrifugally, General Motors Corp., is developing the further application of pearlitic malleable iron in automotive work. Other automobile producers also are considering advantages to be found in pouring metals into shape.

Frank G. Steinebach
Editor

# DUPLEXING

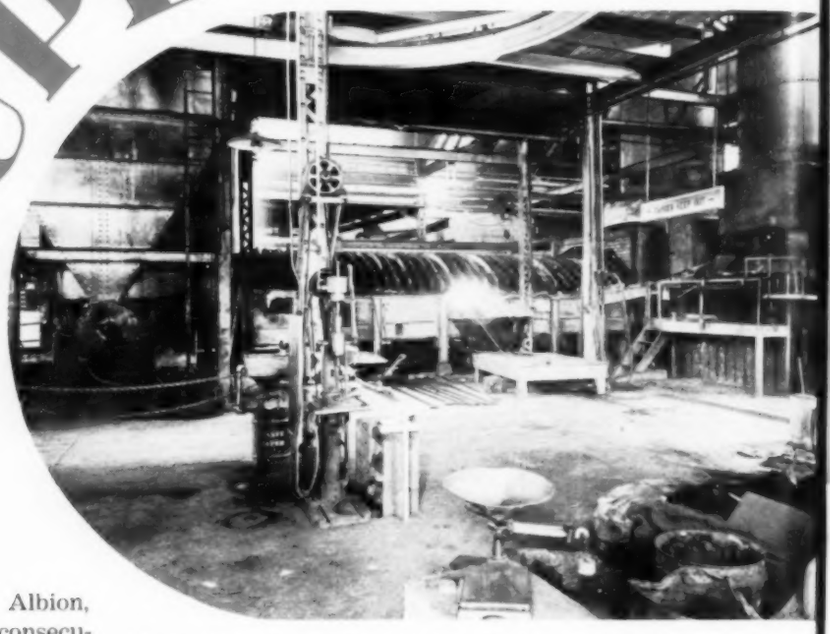


Fig. 1 (Above)—Portion of layout. Fig. 2 (Right)—Layout of melting equipment and charging bins

THE Albion Malleable Iron Co., Albion, Mich., is celebrating its fiftieth consecutive year of successful malleable iron foundry practice. From the time of its organization in 1888, through and including the present year, emphasis has been laid upon application of sound metallurgical principles which govern production of quality malleable iron castings; use of which has been reflected in a steady increase in physical properties to meet increasing service requirements demanded of the finished product.

The melting unit during the years 1888 to 1898 was one 5-ton, hand-fired, air furnace, shown in Fig. 4, and with it the plant operators were successful in the production of satisfactory malleable castings for the bicycle, buggy and farm implement manufacturers.

In 1898 the increase in orders for castings caused a plant expansion program, which included construction of three 10-ton, hand-fired air furnaces as a melting unit. Simultaneously, a step upward in the quality of the iron was noted because of a desired increase in the physical properties in the castings.

With the advent of the automobile and its allied industries an entirely new set up was necessary for producing malleable castings to meet new demands for mechanical and physical requirements. Importance of time to production of castings, as related to the specific control of certain phases of production in the foundry, became necessary to meet volume requirements.

A foundry was built with eight 20-ton, hand-fired, air furnaces. These furnaces had a 52-inch square fire box, 165 square feet of hearth area and 630 square inches opening at the tail wall to allow burned gases to escape. Under the grate and over the bridge wall, air blast was supplied by a 4-ounce volume blower.

Hand firing the air furnaces did not maintain economy in melting, or close enough metallurgical control of the iron. In 1924 the 20-ton air furnaces were increased in size to allow melting capacities of 36 to 40 tons per furnace, and all of them were equipped with pulverized coal firing apparatus.

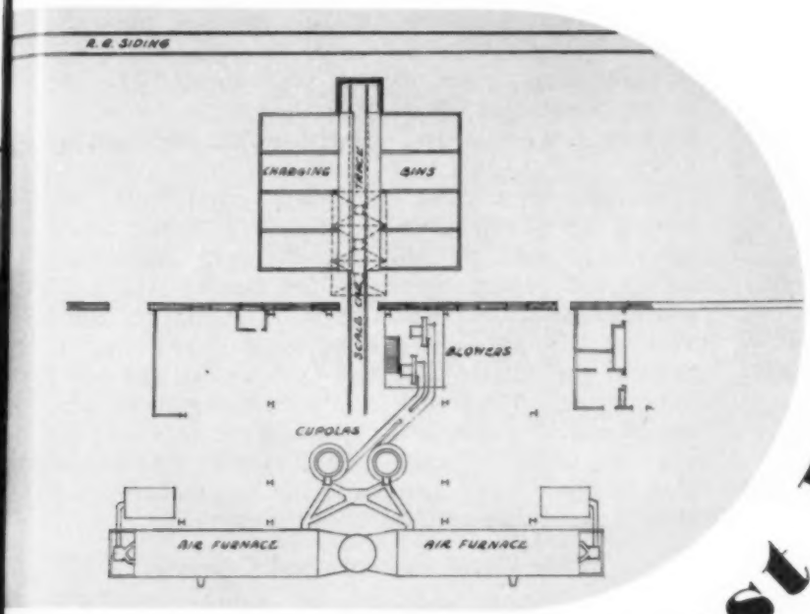
Economies were effected immediately and closer metallurgical control was accomplished.

Interpretation of the modern trend in foundry practice is to produce as many good castings as possible in the shortest period of time with the minimum amount of suitable equipment. Therefore, after much careful study and consultation, it was decided to inaugurate the duplex melting process for the iron.

### Cupolas Melt 20 Tons Per Hour

Duplex melting by cupola and pulverized coal fired air furnace requires the operation, simultaneously, of one or two cupolas, built by the Whiting Corp., Harvey, Ill., standard sizes number seven and eight, and one of two air furnaces as indicated in the layout presented in Fig. 2. Fig. 1 illustrates a portion of the layout. This equipment will produce at the furnace spout, 20 tons of metallurgically desirable white cast iron per hour at 2900 degrees Fahr. An hourly fluidity test indicates approximately 20 to 22 inches spiral length at 2700 degrees Fahr., using a modified form of the A.F.A. spiral casting.

Through experience it has been found that metal with this flowing power will run any casting made in the shop. Melting the raw material charge in the cupola must be watched closely and controlled in mal-




# Malleable Cast Iron

By GEORGE. A. SCHUMACHER
Metallurgist
Albion Malleable Iron Co., Albion, Mich.

leable foundry practice. The corrections for air moisture, size and moisture content of the coke, physical sizes of the components of the charge, and any change in the physical dimensions of the cupola are very vital to production of uniform quality and composition iron.

Charging of cupolas is mechanical, and the charge is lifted from the ground floor to the charging door by a hoist. A bucket containing a typical 1-ton metal charge is comprised of 15 per cent pig iron, 40 per cent steel scrap, 45 per cent remelt, 60 pounds limestone, and 225 pounds fusion coke.

### Charges Lifted By Locomotive Crane

The materials are lifted from the yard storage by a locomotive hoist to individual bins on a charging platform, shown in Fig. 3. It requires 2.4 minutes to fill the drop-bottom, cupola-charging bucket and convey it by scale car to a position under the charging crane. Simultaneous with the charging operation it requires 1.5 minutes to raise, discharge and return the bucket for reloading.

In using 225 pounds of 4-inch byproduct coke, which analyzes 93 per cent fixed carbon, 0.54 per cent sulphur and 6.40 per cent ash with 290 pounds of air per minute for melting, the theoretical charge is usually computed at 1.35 per cent silicon, 1.79 per cent total carbon, 0.83 per cent manganese and 0.085 per cent sulphur. The molten iron in the sump, or forehearth, of the cupola approximates 1.13 per cent silicon, 2.84 per cent total carbon, 0.48 per cent manganese and 0.128 per cent sulphur, and the temperature of metal issuing from the cupola will vary from 2780 to 2820 degrees Fahr. To conserve this temperature in the iron, particular attention is given to the construction and insulation of the run-off trough. The two pulverized coal fired air furnaces are located so that their alternate operation requires the use of one stack. By means of refractory construction in the stack, preheated air for combustion is obtained at a temperature of 500 degrees Fahr. The preheated air, mixed with the correct volume of cold air and powdered fuel, enters the furnace at approximately 270 degrees Fahr., and produces a flame temperature of 3200 degrees Fahr., determined by a pyro-optical pyrometer and observed through a test door located 8 feet from the tips of the burner.

The air furnace is raised 30 inches above the foundry floor, allowing free circulation of air underneath, which helps to dissipate the accumulated heat under the brick bottom in the furnace. The hearth of the furnace is 33 feet long, 8 feet wide and the average sidewall height measures 27 inches. The spring of the arch of the bungs allows 17 inches of additional height above the center of the furnace.

The furnace bottom construction consists of 1-inch iron plates supporting 11 inches of sand in the center line. This center line has a gradual slope of 2 inches from the tail wall and also from the burner wall to a common low point opposite the tap out block. From this low point there is another drop of 1.5 inches to the tap-out block. The firebrick bottom hearth resting on this sand is 9 inches thick. The expected life of the brick bottom should average 1-ton of iron per each brick used in its construction.

By careful flame manipulation and control, when using high-volatile, pulverized coal, it is possible to raise the iron temperature in the furnace 100 degrees Fahr. The metal tapped from the air furnace analyzes 1.10 per cent silicon, 2.55 per cent total carbon, 0.44

Fig. 3—Charging platform serves the two cupolas

per cent manganese and 0.130 per cent sulphur. The sulphur seems to level off at about 0.002 per cent above the cupola metal.

Iron out of the furnace at 2900 degree Fahr. may seem unnecessary. However, the governing factors which require that temperature are distance to some pouring stations, section thickness of some castings and gating design affecting the rate of metal flow.

Duplex melting operations require close chemical control of both the cupola and air furnace iron. The cupola iron is analyzed for total carbon, manganese and sulphur every half-hour. The furnace iron is analyzed for carbon and manganese every 15 minutes, and a silicon and sulphur every half-hour. The sulphur and total carbon determinators, Fig. 5 and 6, manufactured by the Laboratory Equipment Co., St. Joseph, Mich., has been employed to excellent advantage in aiding control.

The term hybrid often has been applied to malleable iron. The author feels that such reference is unfortunate and a misnomer. It gives the prospective user a false conception of a high quality product made under very exacting control. The chemical analysis detailed earlier in this paper will produce, after proper annealing treatment, the following range of physical characteristics: Ultimate tensile strength, 53,000 to 56,000 pounds per square inch, yield point, 34,000 to 36,000 pounds per square inch, elongation, 15 to 20 per cent in 2 inches, and brinell hardness number 125 to 135.

To supplement these standard physical tests, we recently have devised a drift test. A 7/32-inch thick tab is cast with the standard test bar. After the anneal a 5/16-inch hole is drilled through the tab, which allows about ⅜-inch of stock around the hole. This tab with the drift inserted in the hole is placed between the pulling head and the anvil of the testing machine. The pounds on the weighing beams are recorded while the hole is drifted 80 per cent greater than its original dimension. It is well established that this percentage increase in the hole will be more than the customer requires from the castings.

### Molds Placed on Floor and Conveyor

Two methods of molding practice are used in the foundry. Namely, the mechanized line molding and the usual heap or bench type of production molding. The mechanized system is arranged to accommodate 24 molders. Prepared molding sand is delivered to each molder in individual overhead hoppers, from which the sand is dropped when desired.

The completed mold is placed on the conveyor line, poured as it passes the pouring station, and is carried to the shakeout. The shakeout is equipped with a dust collector hood over the grating and controlled suction beneath for removal of fumes and fines. Used sand is passed over a magnetic separator, vibrating screen, through a storage hopper into a pug mill where bonding material, sea coal and water are added to maintain the desired physical properties.

The sand then can be sent to a storage hopper or be returned to the individual (*Please turn to page* 88)

Fig. 4—View in foundry of Albion Malleable Iron Co. in 1888 with hand-fired air furnace A, view into coreroom B, end view of hand-fired annealing ovens C, cupola served by hand-operated, rope lift for melting annealing pot metal D, blower pipes to cupola and furnace E, water supply tub for sand tempering F, tobacco buckets for carrying water to sand heaps G. Castings foreground are agricultural implement parts while those in background are bicycle sprockets. Note absence of bands on molds to right and in vicinity of poles supporting the roof

# VENTILATION Solves Foundry Problem

By EDWIN BREMER

Fig. 1—Side and front elevations of the foundry at the furnace section showing location of ventilating systems

TWO ordinary operations conducted in every shop result in the development of smoke and fumes. Those are melting and pouring, and at certain periods of the year, especially in the spring and fall, atmospheric conditions are such that ordinary ventilating procedures may fail to function. Consequently, the interior of the foundry may resemble a murky fog.

During the summer months little difficulty is encountered in the average foundry to obtain adequate ventilation since all doors and windows are left open to gain advantage of every vagrant breeze. However, during the other seasons of the year the foundry must be heated sufficiently to permit the men to work with some degree of comfort, and opening of any doors or windows within the working level usually gives rise to incoming, colder air currents or drafts which chill the workers in the path of the cold air.

Comparatively recently, however, a system of ventilation has been developed which shows much promise, and it will be of interest to describe its application in a prominent steel foundry where it has operated successfully under a wide variety of atmospheric conditions for the past year. The system, which aptly is termed the air curtain method, employs the principle of developing literally a curtain or wall of air around the area to be ventilated. The air curtain directed downward at a slight angle toward the center to all intent and purpose prevents entrance of the air outside the closely defined area, and hence, to a large degree, eliminates disturbing air currents throughout the remainder of the building. (*Please turn to page* 90)

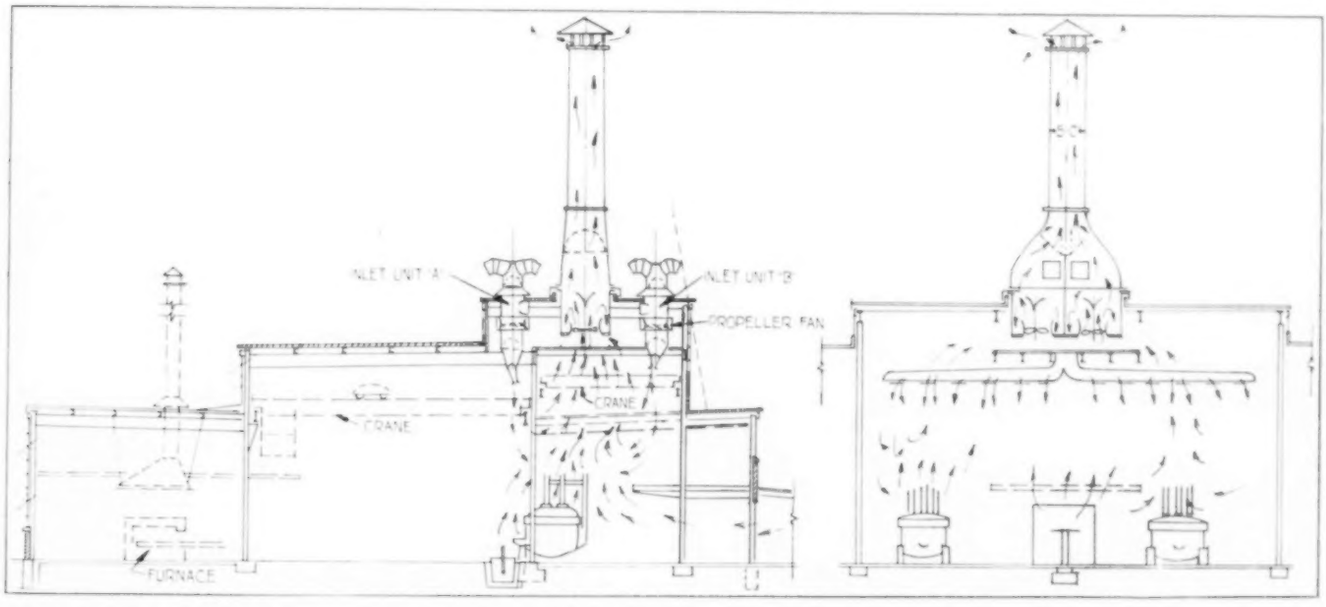



Fig. 2—Sketch of furnaces and ventilating system indicating the flow of incoming air and the outgoing gases

# Patterns Must

By VAUGHAN REID
President
City Pattern Works, Detroit

This is the first part of a paper presented May 12, 1938, before the St. Louis chapter of the American Foundrymen's association, by Vaughan Reid, president, City Pattern Works, Detroit. The second and concluding part will appear in an early issue.—The Editors

CASTING and pattern design is quite a large subject and I would like to dwell mostly on the materials and how they are used in the manufacture of production patterns.

I can not discuss the pattern industry from any angle without a word about proper training of apprentice patternmakers. Many pattern shops employ apprentices for no other purpose than to keep shop and windows clean. I am very much opposed to employing a young man to learn that trade and then refusing to give him a chance to learn it properly. A young man anxious to learn a trade is ambitious and is seeking knowledge. Certainly it is a shame to start right out by discouraging him.

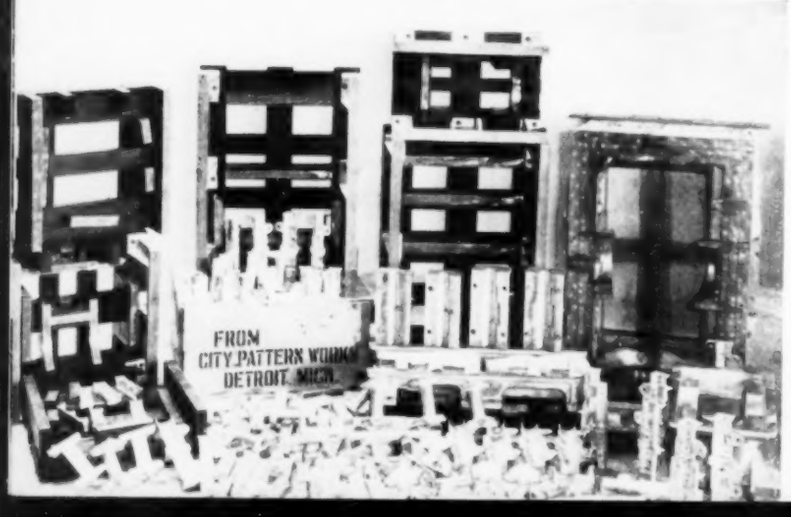
Before an apprentice patternmaker is employed in the shop he should spend at least 2 years in some technical school studying mechanical drawing and learning some fundamentals of patternmaking. We have so many wonderful schools for that purpose in all principal cities that this would be no problem. We have many bright, ambitious young men with just such training looking for a chance to learn the trade of their choice.

After a young man has started his apprenticeship he should continue attending night school to increase his knowledge in drawing, machine shop and foundry practice. He should be placed on probation for the first 6 months. By that time it will be easy to determine whether or not he will become a capable patternmaker. He should be under the care of a competent patternmaker so that he will be given the opportunity he seeks and deserves.

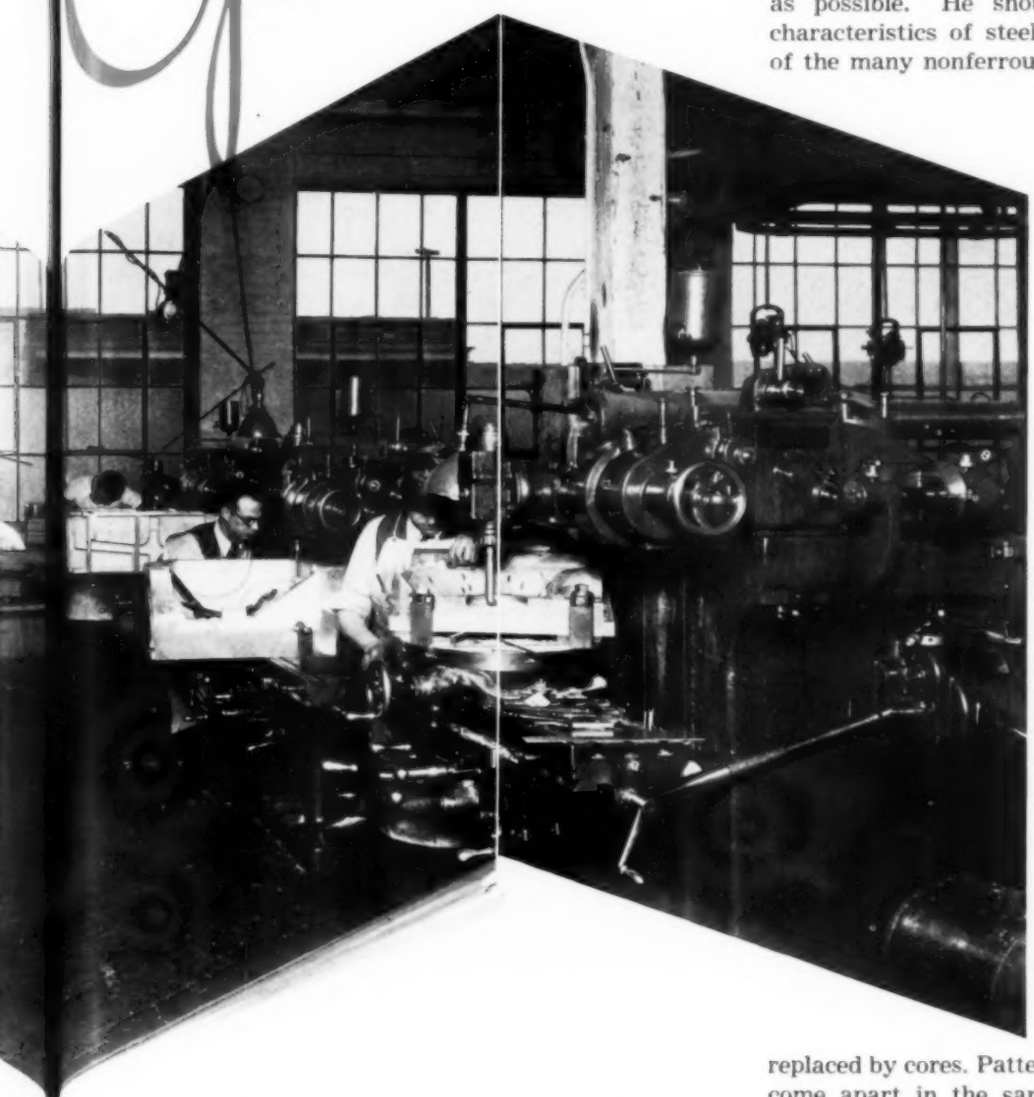
We always will be in need of good patternmakers and we only can expect to get them from the young men started off in the proper way. I do not mean that an apprentice should not keep glue and shellac pots in good condition in the shop. That experience should be included in his training but I am very much opposed to the practice of using an apprentice for a delivery boy or a janitor.

Industry has an obligation to train its men and every plant employing patternmakers must do its part. To refuse to take out this insurance on personnel is as shortsighted as to refuse to carry fire insurance on the property. The supply of skilled patternmakers to replace those lost from the productive ranks annually through promotion, superannuation, new occupations, death, and other reasons, is estimated at 5 per cent. The only way to maintain an adequate supply

**Fig. 1 (Below)—Typical examples of a wide variety of patterns. Fig. 2 (Above)—Power driven tools in wood and metal working shops are arranged compactly. Fig. 3 (Opposite page)—Further typical patterns**



# Be Good



Patternmaking is a trade requiring the highest mechanical skill. Men engaged in this work must have a knowledge of foundry practice, machine shop technique and drafting. A skilled patternmaker usually is able to make drawings as well as read them speedily. From the drawing he must picture in his mind the appearance of the finished article. His knowledge of foundry practice should enable him to establish parting lines that will lessen the time required by the molder and also make production of castings as simple as possible. He should have a knowledge of the characteristics of steel, malleable, and cast iron, also of the many nonferrous alloys. With a proper knowledge of this subject he will be better able to design and build production pattern equipment to suit the alloy and the foundry where the castings will be made.

Years ago, we did not consider the pattern played such an important part so long as the casting met approximate specifications. The automotive industry has changed all these conditions. Today, the pattern equipment is a very important tool required by the foundry. A foundry can not be expected to produce good, uniform, clean castings unless supplied with the proper pattern equipment. Too many foundries try to make castings from models instead of insisting that patterns be designed so that they can be used to best advantage by the molder. The supply of real molders today is not what it was in former years.

In many jobbing foundries solid patterns are used when they should be split or mounted on follow boards. Many loose pieces could be replaced by cores. Patterns are built so flimsily that they come apart in the sand. Cheap lumber goes out of shape and may make it impossible to draw the pattern from the sand.

of patternmakers for this necessary replacement is through planned training of apprentices who will develop skill and ability.

In recent years many automotive parts have been changed to cast metals. This is due to the splendid work of metallurgists who have developed alloys for tough jobs that heretofore required stampings and forgings where castings had not been considered. On account of the work which they are doing, there will be a greater demand than ever before for production patterns. When the automotive business was getting a proper start, we never dreamed that the metallurgical profession would be such a help to the pattern industry in creating a greater need for patterns and in working out the best metals that should be put into the patterns for this exacting class of castings.

Too often pattern equipment is bought on price alone without any consideration being given to ability and engineering qualifications of the pattern source. Plenty of money could be saved by the foundry and the customers if these conditions did not exist. Examination of quite a number of job records from our files shows that after taking the material cost from the labor cost, the material used in patterns is only 10 per cent of the total price of the equipment. The remainder of the cost is for labor. This is the part of pattern cost that should have plenty of study to eliminate as far as possible the use of high priced labor on cheap material.

By studying methods employed in production plants we can adopt many ideas in laying out the pattern shop. Equipment should be so arranged that as few steps as possible will be necessary to get to the machines. Every person has seen pattern shops where time is lost by having patternmakers travel long distances from their benches to machines. Money can be saved if more care is used in the proper placing of various machines. This is quite a large subject and time will not permit going into detail. You have seen pattern shops used for storage purposes as much as for the making of patterns and where the words cleanliness and system are unknown. If patternmakers were taught to be better housekeepers around their benches there would be more accuracy in making patterns. It is quite hard to teach a patternmaker cleanliness when the shop itself is permitted to remain disorderly.

Great care should be taken in selecting materials to be used in wood and metal patterns. Lumber should be the best grade obtainable and never should be used until it has had time to be properly acclimated. It should be kept inside the shop where it is to be used for at least a month, and a longer period would be still better. Climatic change from cold storage to a warm atmosphere invariably changes the character of the lumber. A well ventilated, even tempered, pattern shop means a great deal to the lumber pile. In some pattern shops the moisture content is so ridiculously low that it is even detrimental to the health of the patternmakers. Patterns built under these conditions will swell and buckle when put to use in the foundry. Most of you are well acquainted with the behavior of lumber that is not handled properly. Many times lumber dealers are blamed for conditions when the worst condition prevails right in the pattern shop. Give your lumber pile a chance and you will avoid many anxious moments in addition to making a financial saving.

### Use Care in Selecting Pattern Lumber

Care should be exercised in the selection of lumber for patterns. For master pattern work, we use a northern cork white pine. This lumber, when properly selected and carefully seasoned, keeps its shape and also the accurate dimensions required for master patterns. For working patterns used occasionally and stored in the vault a considerable amount of the time, Mexican mahogany gives the best results. These woods hold their shape over a long period and can take a reasonable amount of foundry handling.

Patternmakers have a definite reason for preferring white pine. Wood patternmaking is an art. A patternmaker chooses high grade white pine for the same reason any other artist finds results more satisfactory when working with his chosen medium. The patternmaker likes this wood because it is easily cut to dimensions, a necessary feature since it enables him to make better time on the job. He might tell you the white pine is soft and will not dull his tools. When you say it is so soft that it requires extremely sharp tools, he assumes a hurt expression and tells you that a real mechanic-artist does not have any use for other than sharp tools.

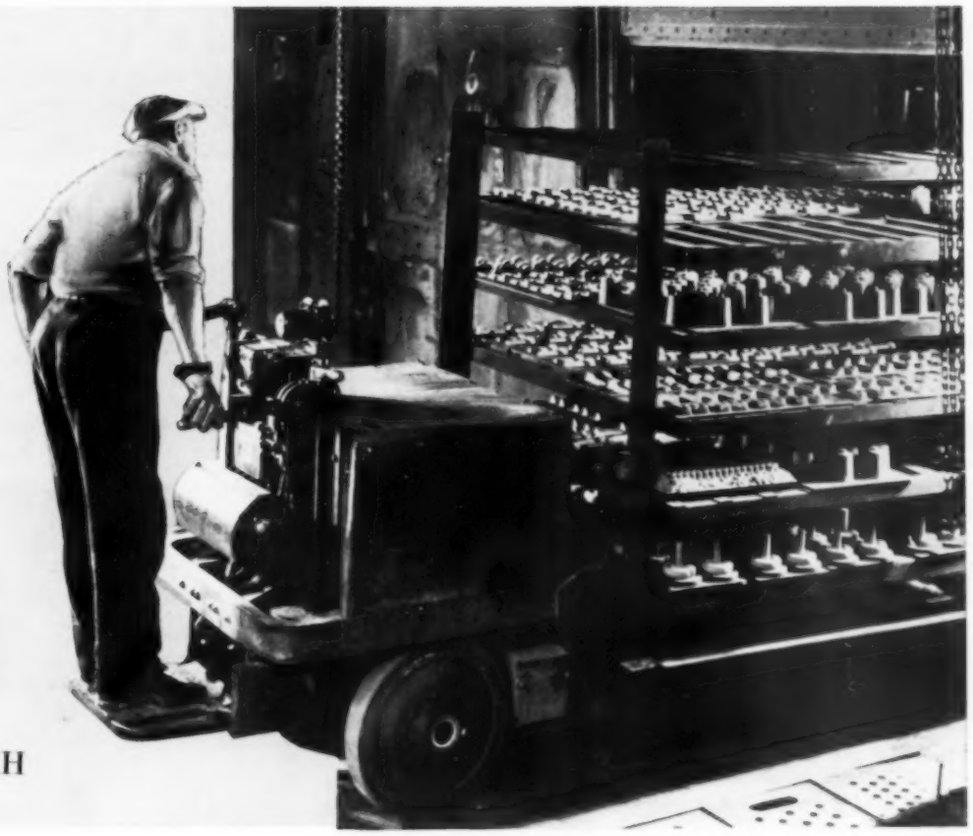
For master patterns, the pine is light in weight, not too light, but not heavy enough to make large patterns difficult to handle. If this lumber is properly selected the swelling or shrinking will be almost negligible. Usefulness of a pattern depends upon its ability to stay in shape. These woods properly seasoned will do just that. A patternmaker will tell you there is a certain amount of wear in a pattern used often and that the ideal pattern wood must be able to resist wear. In a production pattern it must be tough enough to stand up under severe usage.

These woods have wonderful gluing qualities. They will absorb glue and permit the building of large and complicated patterns. Also they can be nailed without splitting. If you want (*Please turn to page* 50)

**Fig. 4—On this profiling machine a master pattern serves as a model for the accurate reproduction of as many duplicate patterns or parts as may be desired**

# Core Making In the Brass Foundry

By N. K. B. PATCH



OIL sand cores for copper-base alloys are made from core sand with a good core oil used as the binder. Primarily an oil sand core has maximum permeability and is the strongest after baking when made from a pure silica sand mixed with oil in the proper ratio. Obviously, a stronger core is produced by adding more binder. However, when a core with an excess amount of binder is subjected to the temperature of molten metal, a large amount of gas is produced, and the casting has a tendency to blow.

Therefore, the ratio of core oil to sand should be the minimum that will give the desired strength for the service intended. Better permeability or venting power is secured when the core is made with coarse grain sand but the green strength is less than where finer sand is used.

Some foundries mix coarse silica sand with a definite proportion of fine silica sand or sandblast dust. Obviously, the more fine sand added to the coarse sand dust the more the openings between the sand grains are filled, resulting in poorer venting or lower permeability. At the same time that practice increases given sand strength of the core and gives the core a smoother surface resulting in a better finish on the casting surface in contact with the core. Silica sand of the A.F.A. 40 fineness is a good size to use. Some foundrymen mix in new molding sand or a definite proportion of sweepings from the foundry. Where sweepings or molding sand additions are made a certain proportion of clay is added with other materials found in molding sand. Those materials when wet act as binders to give additional strength to the green core. They reduce the permeability and also increase the tendency to develop gas if they contain materials that are volatilized by the high temperature of the molten metal.

Students of the core making problem now are avoiding the use of any sand that has not been checked carefully for the presence of vegetable or other matter that will develop gas upon heating. This has resulted in adoption of thoroughly washed beach sand or pure silica sand as the basis of the best core sand mixtures. Mica or micaceous materials also should be avoided since these have a tendency to expand upon being heated and may give rise to objectionable stresses within the castings during solidification.

### Core Dryers Prove Economical

Where intricate cores are to be made it sometimes is preferable to provide dryers to support the core so that the green sand strength is not so important, rather than to provide a core sand with the necessary green sand strength and then have an increase in defective castings which is more costly than provision of the necessary core dryers.

Ratio of core oil to sand varies with different foundries. A ratio of 40 to 1 of sand to oil is about the maximum amount of oil desirable for cores in the brass foundry. It is preferable to use a higher ratio of sand to oil, going even to as high as 60 or 80 to 1 where conditions will permit.

Where the alloy tends to penetrate the surface of the core the surface must be (*Please turn to page* 84)

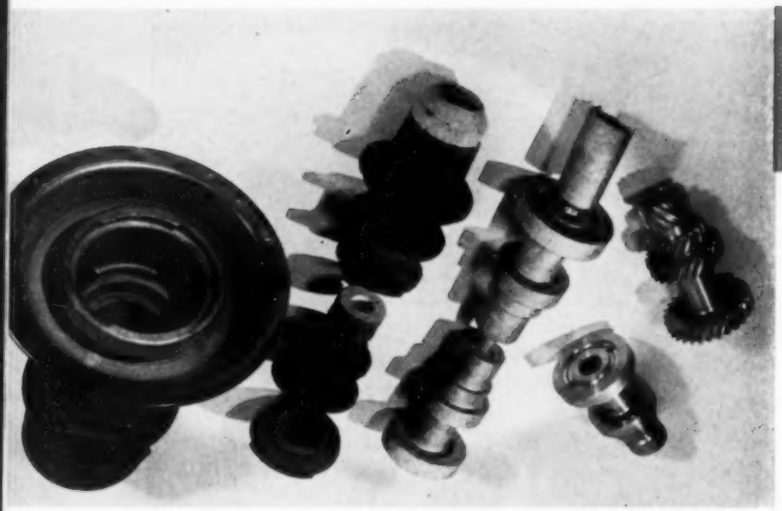


Fig. 1—Centrifugal mold at the left with the cores employed, and a partly machined gear and a fully machined gear at the right of the illustration

# Progress in

By R. H. McCARROLL
Chief Metallurgist
Ford Motor Co., Detroit

This article is from a paper presented by the author at the second A.F.A. Fall Technical Conference held in cooperation with the University of Michigan and the Detroit chapter at Ann Arbor, Mich. on Sept. 15, 16 and 17.

IN PRESENTING a paper on contributions of the Ford Motor Co. to development of automotive steel castings, we do not feel that it is necessary to describe in detail the materials and methods used on parts which have been in production for some time. Many of these major developments such as the casting of valves, crankshafts, pistons, etc. have been described by editors and special writers in a better manner and in more detail than is possible here. However, a full list of these publications will be found for reference at the end of this paper.

Instead we will only mention these early parts, giving the date of first large scale production and an estimate of the number and weight so far produced. We will then tell you something of the work now in progress although changes and improvements come so rapidly that some of this story may soon seem like ancient history, and finally discuss briefly what these developments may mean to the industries concerned.

### Steel Castings in Automobile

At present there are not less than 149 pounds of finished cast steel parts going out in each Ford car. We say not less because this is being exceeded in cases of experimental production on some parts.

The regular parts are as follows:

*Valves*—started in 1931 of which over 56½ million have been produced, weighing finished more than 5,225 tons.

*Crankshafts*—started in 1933 of which over 4½ million have been produced, weighing finished more than 137,000 tons.

*Valve Seats*—started in 1934 of which more than 34 million have been produced, weighing more than 695 tons.

*Wheel Hubs*—started in 1935 of which over 8¼ million have been produced, weighing more than 67,850 tons.

*Pistons*—started in 1935 of which more than 16 million have been produced, weighing more than 5,000 tons.

Fig. 2—Various types of centrifugally cast steel parts including cluster gears, ring gears, and other gears for experimental purposes cast by the same author

While this paper deals with the use of cast steel parts, it might be well to illustrate here two notable exceptions where alloy iron parts have replaced steel forgings. These are the push rod and camshaft. We have selected these two parts because of their unusual composition and treatment, because they have replaced steel parts and because they have so improved quality and decreased cost.

*The V-8 Push Rod*—started in 1933, over 60 million having been produced, weighing more than 3,500 tons.

And the *Camshaft*—started in 1935, over 3 million having been produced, weighing more than 12,000 tons. You will find their manufacture described in the references listed.

As an introduction to the work now in progress, let us first look at the analysis of the materials available and their physical properties. For convenience in specifying we have divided our list of cast steels into seven classes, and in addition have special analysis for the valve and valve seat inserts. These specifications are shown on the accompanying cast steel analysis chart, which includes class number, representative parts, analysis and some typical heat-treatments.

There has been considerable discussion as to the proper name for some of these materials, particularly in the higher carbon ranges like that used for crankshafts. This we would like to further discuss at this

# Automotive Steel Castings

time. The subject is worthy of quite extensive comment.

In the bibliography listed you will find an interesting article by H. W. Russell of the Battelle Memorial institute, published in *Metals and Alloys*, December, 1936, titled "Resistance to Damage by Overstress of Precipitation-Hardened Copper-Steel and Copper-Malleable." The publishers were kind enough to include with this article some comments of ours giving our reasons for classifying this material as steel, rather than under the term "Pearlitic Malleable" used by Mr. Russell. Because we believe this is important to all of us, we would like to repeat those comments here.

"*First:* Referring to the iron-carbon diagram, this material is within the range previously defined as steel.

"*Second:* The modulus of elasticity of this material is within the usual steel range, being from twenty-eight to thirty million and not within that of gray iron or that of malleable iron.

"*Third:* Referring to the publication of a discussion at a meeting of the American Foundrymen's Association on Pearlitic Malleable Irons presented Jan. 27, 1936, at Cleveland, reference is made to high carbon cast steel as differentiated from pearlitic malleable because such steels as cast are solid, homogeneous single phased alloys. We believe that our crankshaft material fits these definitions of the A. F. A. for high carbon cast steel.

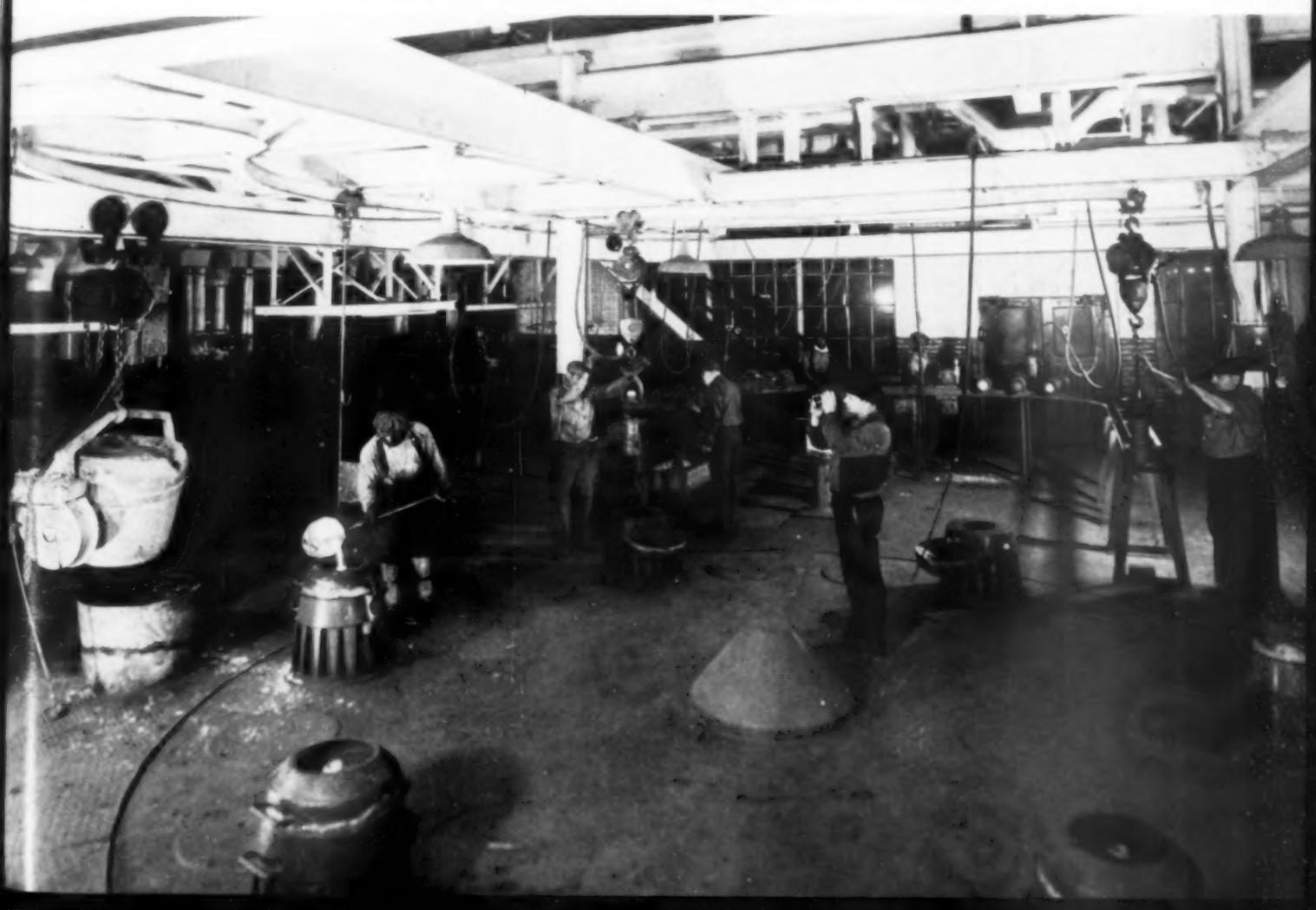
"*Fourth:* The Ford Motor Company has a so-called Quick Malleable often given a heat-treatment, leaving it purposely partially pearlitic, referred to in U. S. Patent No. 1,871,545 (McCarroll and Vennerholm).

"*Fifth:* This crankshaft material does not fit the definition given by Bornstein and Bolton in the A. S. M. Handbook for any type of cast iron."

Now so much for the technical reasons, but beyond this we have, we think, some very practical reasons.

To general public, non-technical executives, and others who are not familiar with the progress in cast metals in the last few years, cast iron means a weak brittle material. Many of these people think of cast iron and, in some cases, all cast materials, as stove plate iron which when they (*Please turn to page* 72)

**Fig. 3—Centrifugal casting machine consists of a 22-foot turntable on which 18 pouring stations can be mounted. At present only 6 stations are installed. The table makes one revolution every 4 minutes**



# Trains Run on Chilled Car Wheels

By PAT DWYER

MANUFACTURE of chilled cast iron car wheels, admittedly one of the most highly specialized branches of the foundry industry is exemplified at the Chicago plant of the Griffin Wheel Co., a company identified prominently with this branch of the foundry industry for nearly 100 years. Constant, persistent research toward further perfection in this class of castings has resulted in the development of methods, equipment and material to an extent rarely achieved in any other section of the foundry field. Despite the exceedingly severe specifications with which these castings must conform, the foundry loss over any given period rarely exceeds 1.00 per cent.

Originally owing to the fact that only jib type cranes were available, wheels were molded by hand in a circle around the crane. Recognized day's work for a molder and helper was 25 molds. This involved handling approximately 8 tons of sand, ramming 25 drags and 25 copes opening and closing the molds, setting the cores, pouring the iron and shaking out the castings. Later when electric cranes and hoists were introduced the molds were set up in straight, parallel lines extending from one end of the shop to the opposite end.

Usually the cupolas were located at one end of the foundry and the annealing pits at the other end. A small buggy attached to a cable and operating on a narrow gage track between each pair of floors, carried the red hot wheels to the annealing pits. A great deal of hot, heavy manual labor was involved in the production of chilled car wheels either on the circular or straight line floors.

### Mechanical Equipment Replaces Manual Labor

In the latest type of wheel foundry typified by the plant operated by the Griffin Wheel Co. in Chicago, and in several other plants operated by the company elsewhere, mechanical equipment practically has eliminated all the drudgery and hand labor. Mechanical equipment also provides the medium for exercising closer and more accurate control over the various operations, preparing the sand, making the molds, pouring and melting the metal. Hazard incident to chance of error, always present where the human element is involved, is reckoned as a factor of relatively minor importance where mechanical equipment tirelessly carries the load.

Not the least interesting feature in connection with the change over from a manually operated foundry to a mechanized unit without any material stoppage of production, is that the work was done at Chicago in 5 months, from Oct. 1934 to Feb. 1935. This included installation of sand preparation and

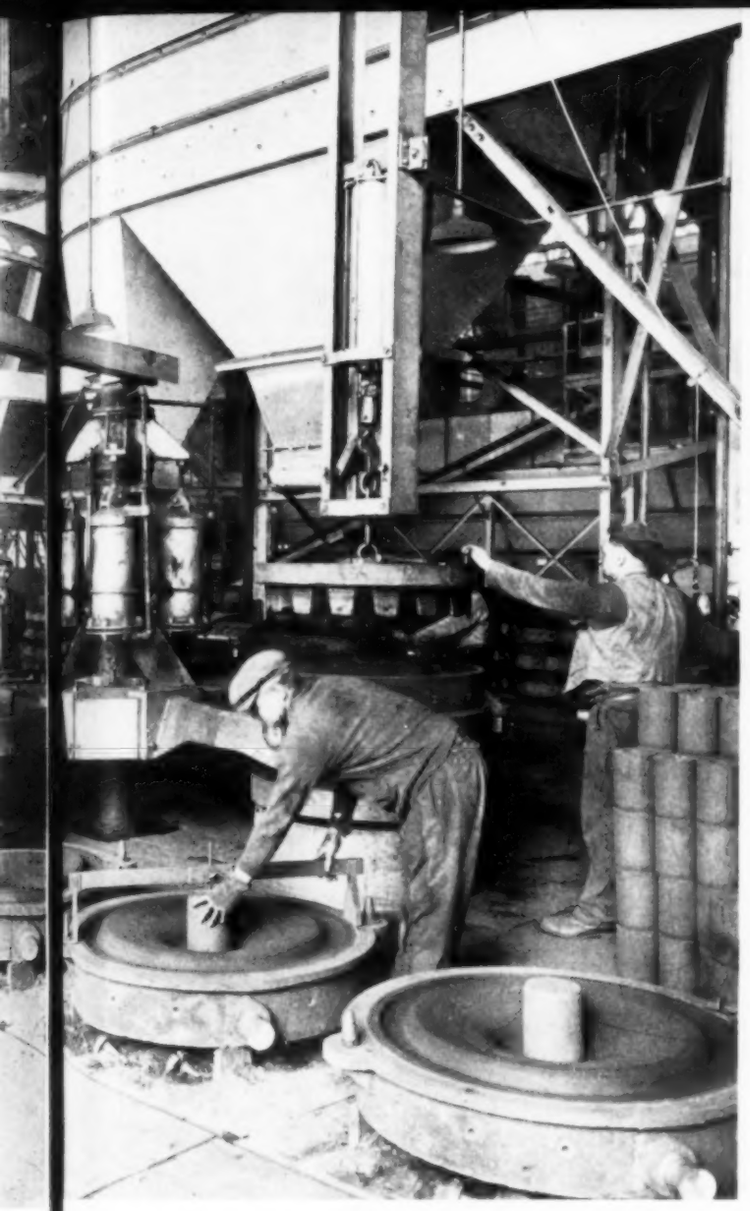


Fig. 1 (Left)—Drag and pattern plate are lifted and rolled over as a unit. (Right above)—A gage is employed for centering the core in the drag

handling equipment, an elaborate dust collection system over the shakeout, a rectangular conveyor made up of 126 cars in the molding and pouring section, hot blast installation on the cupolas, skip hoists for charging the cupolas and general rearrangement of the stock yard for more efficient transportation of metal, coke and limestone.

The principal feature of the mechanical foundry is the mold conveyor which carries the flasks and molds around the circuit of the shop; passing successively the drag molding station, cope molding station, pouring station and shakeout station. The molding machines are located near the center of one long side of the rectangle. The pouring station is located directly opposite on the other side and the shakeout is located at one end. The sand preparation plant adjoins the shakeout station and the prepared sand is conveyed by overhead belt to the two molding stations.

Instead of moving continuously, the electrically operated conveyor moves forward one car length after each mold has been placed in position. In this manner no confusion results when and if for any reason a temporary halt occurs in the regular sequence of production.

Molding machines have been specially designed and constructed for the production of car wheel castings. They employ the familiar jolt and squeeze principle, but present several interesting variations in the application of this principle. Instead of raising the mold against a pressure plate, a heavy weight is lowered on to the sand immediately after the flask is filled with sand. This heavy cast iron circular weight carries projections on the lower side.

Openings between the projections correspond to the bars with which cope and drag are equipped. Thus while the mold is jolted on the table of the machine, the weight on top actuated by gravity packs the sand to the desired degree of density. This method also materially reduces the amount of sand required in each flask. Projections on the weight form hollow spaces between the bars approximately 3 inches deep.

### Sand Is in High Permeability Range

This feature is of particular importance on the drags where it promotes the ready exit of steam and gas when the mold is filled with molten iron. For the same reason no bottom plates are attached to the drags which are supported on three or four small blocks on the cars. The sand is coarse and open with a high permeability rating. Combined effect of these factors is so efficient that the metal lies perfectly quiet in molds sprayed with wet blacking approximately 30 minutes before the iron is poured into them.

The multistage drag molding machine with four arms 90 degrees apart swinging on a central vertical revolving mast is shown in Fig. 1. Each arm is equipped with a pattern of the back plate of the wheel which is rotated successively to the four sta-

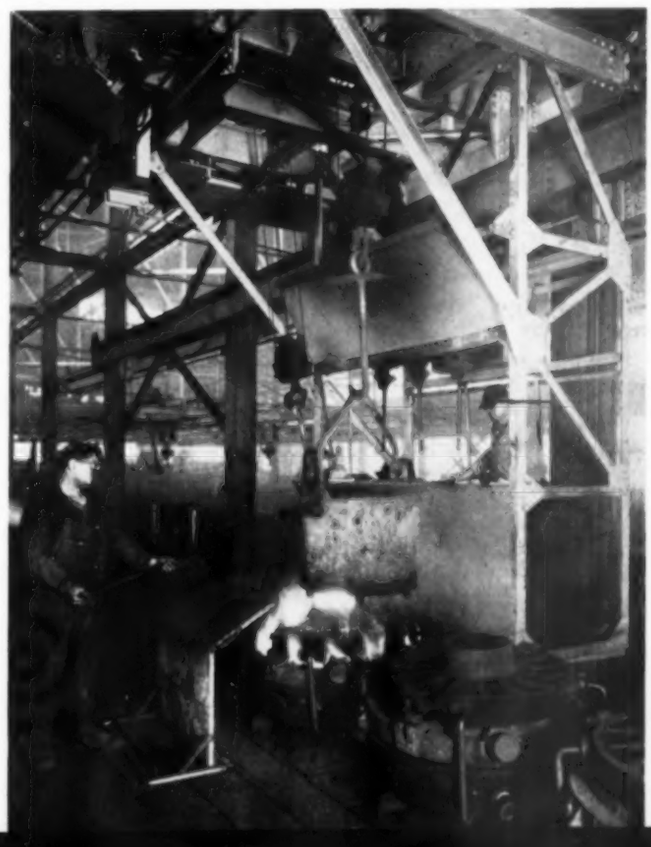


Fig. 2—The conveyor halts temporarily in front of the pouring station while the operator fills the mold with molten metal from an opening in the bottom of the ladle

tions. The wheel is molded and poured in position opposite to that which ordinarily is employed in foundries making casting of the same general character. The flange of the wheel and the face farthest away from the observer when the wheel is in position under the railroad car, are molded in the drag. The tread of the wheel is formed in a circular chill attached to the cope. The upper face of the wheel, the face visible to any person watching railroad cars rolling over the rails, is molded in the cope.

At station No. 1 the pattern is brushed, the serial number adjusted and the facing sand is riddled over the face of the pattern. This requires about 30 seconds for two men. After the operations at station No. 1 are completed the arm is raised, turned 90 degrees, thus bringing a new pattern to station No. 1 and advancing the partially completed mold to station No. 2 where the flask is filled with molding sand by opening a gate on the bottom of an overhead hopper.

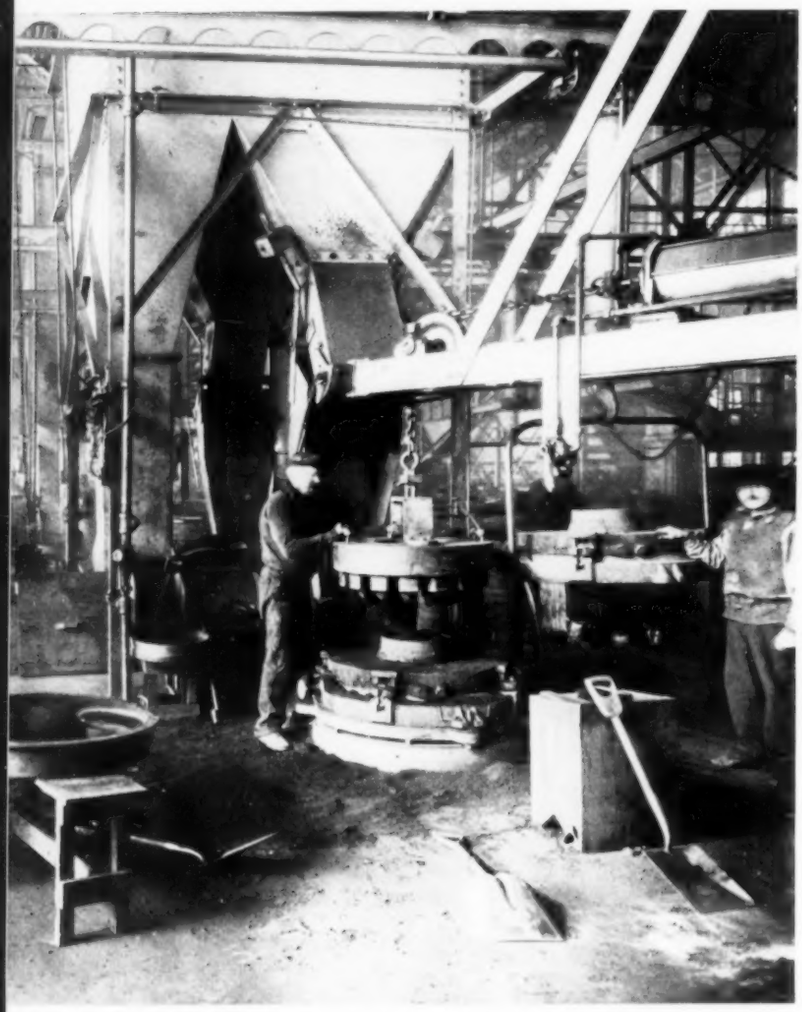


**Fig. 3—A weight with projecting members on the bottom rests on the sand during the jolting operation**

Two or three jolts cause the sand to settle in the flask and the surplus is struck off level. This completes the operation at station No. 2. The arm is raised by an air hoist attached to the center and turned another 90 degrees bringing the mold to station No. 3. Here the ramming plate weighing about 1600 pounds is lowered into position on the sand with the projections between the bars. Six or 8 jolts complete the ramming of the mold.

The arms are again raised and swung through an arc of 90 degrees, bringing a new mold to each station. At station No. 4 the drag flask is clamped to the pattern plate and turned over by swinging on trunnions. The arms are lowered until the mold rests on the conveyor. The clamps are released, the arms raised thus drawing the pattern from the mold. The pattern plate then is rolled over on the trunnions and swung into position at station No. 1.

The complete cycle requiring the services of five men is performed in less than one minute and 75 drag molds can be placed on the conveyor in 1 hour. When the pattern is drawn from the mold at station No. 4 the conveyor moves forward one car length ready to receive another mold. With the drag on the conveyor the face of the mold is sprayed with wet blacking. The center core is placed in position and gaged for center and height.

The cope molding station is shown in Fig. 3. A pattern of the front plate of the wheel is attached to the table of a jolt machine. The cope flask with chiller attached is lowered into place over the pattern. Facing sand is riddled over the pattern and the flask is filled with sand from an overhead hopper. The mold is given two or three jolts to settle the sand and then a weight similar to that used on the drag is lowered on top of the sand and the ramming is completed with 8 or 10 jolts.

### Copes Are Made on Three Machines

After the weight is removed the pouring dish in the center is peened and finished. The cope is lifted from the machine with an air hoist and rolled over in the trunnions for examination and finish. A thin coating of chill paste is applied to the face of the chiller and then the cope is lowered on to one of the drags which by this time has arrived in front of the cope machine. Operation of three cope molding machines synchronize with the operation of the four arm drag machine.

Method of gating car wheels, developed many years ago and recognized as standard practice in all wheel shops, presents an interesting example of simplicity and efficiency. A cap core provided with three gate openings is placed over the core print on the cope pattern. Size of the gate openings varies to correspond with the weight of the wheel. A slightly tapered cylindrical wood block, approximately 1-inch less in diameter than the core rests on top of the core and sand is packed around it inside the circular pouring dish which forms part of the cope. When the block is removed the core is anchored in place. The opening left by the block serves as a pouring basin, a reservoir and a dirt catcher. Metal enters the pouring basin from a nozzle in the bottom of the ladle.

Operation of the cupola is regulated to meet the daily production schedule. To pour 60 wheels per hour the cupola melting rate is approximately 24 tons per hour. The shop is equipped (*Please turn to page* 78)

# Among Detroit Foundries

Cores for cylinder blocks are set by gage. Illustration courtesy General Motors Corp.

EMPHASIS on quality of castings, especially those for automotive applications, is bringing into many foundries a more general understanding and appreciation of the metallurgical aspects of producing castings. This is not to infer that foundry metallurgists only recently have come into the picture, but rather that the results of metallurgical research on foundry operations steadily are being translated into improved methods and equipment aiming toward closer control of melting, molding, pouring and the related phases of foundry technique.

For example consider control of pouring temperatures and its effect on iron analysis and properties. In a large foundry near Detroit wide fluctuations in pouring temperatures have resulted in a consequent serious swing in carbon and silicon contents which later show up in troubles besetting the machining department.

A cylinder block casting, may be adjudged O. K. as it is shaken out of the mold in which it is poured, and after routing through the rough millers still may be thought satisfactory. Perhaps in the reaming or honing operations the iron proves to be so soft the resulting bores are considerably oversize and the block must be rejected. Conversely a hard iron may result in inability of the honing tools to finish up to size.

In the opinion of metallurgists, this form of trouble can be traced back to variations in the temperature at which iron is poured into the molds. One answer may be the use of holding furnaces such as Ford now is using on a number of casting operations. Cupola iron is tapped into these holding furnaces where the temperature is controlled closely, and then is tapped out continuously into small ladles which empty into passing molds. In one setup at the Ford foundry, the holding furnace taps from both sides to supply two parallel casting lines. Exceptionally close regulation of iron temperature is possible.

In another setup the tilting type holding furnace, supplied by alternate cupolas is so regulated that a measured amount of iron is directed into small ladles which in turn fill flywheel molds mounted on a conveyor line. It is possible to cast 15 flywheels per minute under this completely automatic arrangement, which required a considerable amount of experimentation to synchronize properly.

Naturally, continuous melting and continuous pouring implies a continuous supply of molds. If a mold is not ready in its place on the line, there is no way of shutting off the supply of iron. To take care of such a situation, it is proposed to cast any shots of iron for which no molds are waiting into pigs which can be charged back into the cupolas.

Work which Ford foundry technicians are doing with the combination air furnace and rebuilt small cupola likewise is in the direction of continuous melting. A new type of tapered roof is being placed in the air furnace or forehearth in an effort to make the equipment stand for a longer period. The cupola itself is nothing more than a stack for draft and charging, the only firing being through a single powdered coal burner in front of the forehearth.

It is reported that work on this equipment has been going on for about two years. The operators are not yet satisfied with results. With characteristic determination Ford engineers are attempting to overcome present difficulties and make a production unit out of the installation. Capacity is about 2½ tons per hour, and it is understood two additional stacks are stored on the premises waiting the day when the present equipment operates satisfac- (*Please turn to page* 83)

# QUESTIONS and ANSWERS

## Slight Depression on Cope Side Causes Casting Rejection

We are forwarding a disk casting about 10 inches diameter with several bosses on the drag side. Our losses on this casting due to slight depressions on the cope side run from 1 to 6 per cent. The copes are made on a squeezer and the drags on a jolt squeeze stripper. The castings are molded two at a time and the bottom boards have a ½-inch pressure strip around the outside and another across the center. We use a synthetic sand tested three times a day, moisture 3 to 4 per cent, permeability 60, bond 30. Opinion is divided on whether the defect is caused by the iron or the sand.

The slight depressions on the cope side are caused by steam. This extra steam is generated when the metal fills the pockets in the drag. If you were molding the castings by hand you would vent the drags with a wire and have no trouble. In mass production the method is to use a more permeable sand. Since your loss is only between 1 and 6 per cent it is apparent that your sand is almost perfect. A slight increase in the permeability will insure all good castings. Your bottom boards with the strip around the edge and across the center are partly responsible. They prevent the steam from escaping rapidly enough. A few holes in the boards would be helpful.

## Synthetic Sand Used by Choice In Steel Foundries

At a recent foundry convention in Europe a speaker stated that in United States steel foundries all the sand has to be washed and screened, because no natural molding sand is available in that country.

Steel foundries in this country use a synthetic sand not from necessity but from deliberate choice. As you are aware, steel is melted and poured at an exceedingly high temperature, approximately 3000 degrees Fahr. (1650 Cent.) A practically pure silica sand is required to withstand this temperature. Silica sand in the pure state has no bond and therefore cannot be used in that state for molding material. A small quantity of binder is necessary. No natural sand contains the proper proportions of silica sand and binder to serve satisfactorily. Therefore, steel foundries in this country have adopted the universal practice of using a pure silica sand blended with the desired amount of artificial binder.

Vast deposits of silica sand are available in many sections of the United States. Therefore, the sand can be delivered to the steel foundries at comparatively low cost. Washing and screening operations are not performed at the foundry. The sand producing companies attend to that feature and deliver the sand to the foundries according to any desired specification, grain size, etc. In the foundry the batches of sand are treated in a mixer where the desired amount of clay, cereal binder and water are added. In that manner the composition of the sand is kept under close and accurate control.

## Manganese Steel Castings Have Pock Marked Surface

We are having trouble with facing sand for 12 per cent manganese steel. The castings are 24 x 30 inches and 3 inches thick, and weigh about 550 pounds. Can you give us information on the most suitable facing for that work?

A definite reply to your request for a suitable facing sand for manganese steel castings is hardly possible because you do not mention what the trouble is, nor do you state whether you are employing green sand or dry sand. However, we presume that you are using dry sand, and the trouble is that usually termed *pock marks*. As a matter of fact, few firms obtain a really smooth surface on manganese steel in heavier sections, either green or dry. Manganese steel is so prone to cut into the sand that a pretty rough looking job is turned out with large pieces.

A good dry sand mixture, using fairly fine sand, and washing heavily with silica flour wash does a fair job. However, to the best of our knowledge, the most suitable results are obtained with cement-bond molding process which as you undoubtedly know, is a patented procedure. The process was described in considerable detail in a series of three articles which appeared in the January, February and March, 1936 issues of THE FOUNDRY. We understand that for manganese steel a special material is employed in cored holes and sharp corners.

## Dirt in Sleeve May Be Result Of Gate Becoming Dry

We are forwarding for your inspection a gray iron sleeve liner 4 inches diameter, 12 inches in length, ⅛-inch thickness of metal finished. Finish allowance inside and outside is only 1/16-inch. These castings are poured on end in green sand, gated at the bottom through a strainer core. We make these sleeves in a wide variety of sizes, but this is the only one with which we have any trouble. You will note the machining operation has disclosed several small defective areas on the inside. The metal is tapped at 2810 degrees Fahr., into a mixing ladle and does not drop in temperature to any great extent before it is poured into the molds.

The porous areas in the casting are caused by small amounts of scum which float upward to various points in the mold and then stick to the core. The source of this scum can be determined only by a process of elimination. The amount is so small and your general practice based on extended experience presumably is so perfect, that a critical and intimate examination of every detail in the sequence of operation will be necessary. Manifestly the dirt is not slag entrained in the metal, since if that were the case, it would appear in other types of castings. In our opinion the small foreign inclusion is picked up at some point between the pouring basin and the gate entrance.

If the basin is green sand it is possible that the surface of basins made early in the day become dry before the metal is poured into them. The falling metal washes a small amount away and this material enters the mold. Sand around the sprue may not be as firm and erosion resistant as it should be. A critical examination of the metal left in basin and sprue may furnish the clue to your trouble. The sand around the gates in the bottom may be rammed too hard, thus setting up a slight boiling action in the metal before it enters the mold. This boiling action may not be sufficient to produce definite blow holes in the casting, but it may be sufficient to develop small amounts of frozen slush that stick to the wall of the core or the mold.

## Aluminum Water Heater Casting Leaks Under Pressure

We are making an aluminum hot water heater casting 4½ inches diameter, 11½ inches in length, closed at one end. The metal thickness is 3/16-inch and the casting must withstand a water pressure test of 100 pounds per square inch. We are using a scrap mixture of cast aluminum automobile engine heads and pistons with the addition of 10 per cent zinc. The metal is melted in a crucible in a coke fire. The core mixture is 45 parts sand and 3 parts sawdust with an oil binder. Some of the castings leak while others are perfect. Would you suggest a more suitable metal mixture? What is the ideal pouring temperature? If we changed to ingot metal what alloy is the most suitable?

Aluminum castings to resist a pressure of 100 pounds per square inch may be produced from your present mixture provided the metal is melted properly, the cores vented adequately and the molds gated in a suitable manner. We are inclined to the opinion that one or more of these factors and not the metal is or are responsible for the defective castings. In this particular instance the zinc is of no particular value and may be omitted. The ideal metal for the purpose is a silicon aluminum alloy containing approximately 5 per cent silicon. A suitable pouring temperature is approximately 1300 degrees Fahr.

The most probable cause of your trouble is the core. It is not sufficiently permeable, or the gas does not escape readily enough through the vent. The result is that the metal flutters slightly when it first comes in contact with the core. While the flutter does not produce actual blowholes, it creates porous areas, particularly in the vicinity of the gates. Instead of a solid core with your present mixture, try a shell about 1 inch thick and also provide a generous vent opening from the end of the mold core print to the open air. Pour the metal through two thin, flat gates in the cope side of the mold and at both sides of the casting close to the open end. If the cope is not deep enough, place a pouring cup on top to provide head metal at least 6 inches above the top of the casting.

## Supplies Details on Use and Properties of Bentonite

We are interested in the possible use of a material known as bentonite as a synthetic binder for ordinary core and molding sand. We understand this material is used extensively in America. We shall appreciate information on this material and its use as a binder.

Bentonite is a widely distributed and peculiar type of clay considered to be the result of devitrification and chemical alteration of the glassy particles of volcanic ash or tuff. The material originally was called Taylorite after William Taylor of Rock Creek, Wyoming, who first called attention to it, but as this name already had been allotted to another mineral, the name of bentonite was used, because of its occurrence in the Fort Benton series of rocks. The material does not carry an abundance of amorphous gel substance, but it does contain a large amount of finely divided crystalline substance and in this sense is colloidal.

High adsorptive powers are due to physical structure. Physical properties and chemical properties vary to a considerable extent depending on the location of the deposit. Bentonite has been reported from every state west of the Missouri river, also from Kansas, Oklahoma, Texas, Louisiana, Arkansas, Tennessee, Alabama, Virginia, Kentucky, Pennsylvania, Minnesota, Wisconsin, etc. In Canada bentonite deposits have been noted in Manitoba, Saskatchewan, Alberta and British Columbia. It also has been found in Alaska and foreign countries.

Practically all the bentonite used in the United States foundries comes from Wyoming where it is mined, processed and shipped as a fine dry powder. For foundry purpose it may be described as a highly concentrated form of bonding material and in that capacity is employed extensively in imparting the necessary green strength to core and molding sand mixtures which lack in this respect.

Members and guests of the Southern California Chapter of the American Foundrymen's association had an enjoya[ble time]

## Cupola Melts Far Below Capacity

We have a cupola lined to 27 inches and with four tuyeres 2½ x 5 inches. Our heats run from 1200 to 1800 pounds. On an average heat of 1600 pounds the wind is on for an hour. The 1600 pounds is made up of four charges, with a 36-inch coke bed above the tuyeres and with approximately 100 pounds of coke between the charges. The iron is broken into small pieces, about 25 per cent pig iron and the remainder good machinery scrap and remelts. The iron is hot throughout the heat, but it melts too slowly. Blast is supplied by a No. 3 fan. At what speed should this fan run to melt iron at the rated capacity of the cupola. We need a close grain, easily machinable metal. What is the correct proportion of No. 2 pig iron, machinery scrap and steel scrap.

Rated capacity of a cupola lined to 27 inches is 5700 pounds per hour and the tuyere area of a small cupola should be approximately one-fifth of the cross sectional area of the cupola. To melt at maximum efficiency this cupola requires about 1150 cubic feet of air per minute. The cross sectional area of a 27-inch diameter cupola is 583 square inches. Therefore the combined area of the tuyeres should be approximately 120 inches instead of the 50 square inches of the present tuyeres. This means four tuyeres 3 x 10; 4 x 7; 5 x 6; 5½ inches diameter or any other shape to provide approximately 30 square inches for each tuyere.

According to the manufacturer, the fan you now have is capable of delivering 1200 cubic feet of air per minute when running at 2790 revolutions. Apparently the fan is delivering only approximately one-third the volume of which it is capable. Excessive amount of coke between the charges also retards the melting speed.

For small heats of 1200 to 1600 pounds you can divide the charge in two instead of into four. The bed will melt the first charge and one split of coke will melt the second charge. The correct mixture of materials, pig iron, scrap and steel will depend on the sectional thickness of the castings. A mixture at the lower silicon limit, suitable for a casting 1-inch in thickness will be chilled in a section ¹⁄₁₆-inch thick. At the opposite extreme a dense, close metal in a section ¹⁄₁₆-inch thick will show an open structure in a thick casting.

## Sand in Cope Draws Down on Casting

We are making a diesel engine fly wheel about 1 ton in weight and some of the castings scab on the cope side. The facing sand containing about 4 per cent pitch binder is black washed and skin dried. We are forwarding a sample of this sand for your inspection.

Casual examination of the sand sample submitted would seem to indicate its suitability for facing on the fly wheel casting. We are inclined to the opinion that the small scabs to which you refer are not true scabs, that is portions of sand forced out of place by an accumulation of steam. In this particular instance the sand probably *drew* or *pulled down* from exposure to the rising metal for too great a period. The obvious remedy is to increase the number or size of the gates and thus fill the mold more rapidly.

## Brass Repair Parts Can Be Supplied

On account of duties, transportation, rates of exchange, etc., including the use of a considerable amount of scrap brass, we can make brass casting here at a lower price than malleable iron castings can be imported from the United States or from Europe. Can you give me a formula for brass that would be suitable for repair parts of agricultural machinery ordinarily made of malleable iron. The most essential feature is the ability to resist shocks, twists and jars from rough usage. How does the strength of brass castings compare with that of malleable iron?

Certified malleable iron made in the air furnace has a tensile strength of 50,000 pounds per square inch, yield point 36,000 pounds per square inch and average elongation in 2 inches of 18 per cent. Cupola malleable going into pipe fittings and certain classes of castings shows a tensile strength of 38,000-40,000 pounds per square inch. Ordinarily brass and bronze, that is run of mine stuff made from all or nearly all scrap mixtures, will have a strength of 20,000-25,000 pounds per square inch.

Manganese bronze and aluminum bronze show a tensile strength of 65,000 pounds per square inch. With suitable heat treatment this may be raised to 85,000-90,000 pounds. Gun metal which comes nearest to showing the physical properties of mal-

enjoyable time at the annual outing which was held recently. As the illustration indicates a large group attended the festivities

leable iron probably would meet your anticipated requirements. The composition may vary to some slight extent, but the following is typical for a 100-pound charge: Copper 86 pounds 8½ ounces; tin 11 pounds 12 ounces; zinc 1 pound 11 ounces, and 15 per cent phosphor-copper ½ ounce. This metal shows a tensile strength of 46,000 pounds per square inch, elongation in 2 inches 25 per cent, reduction in area 25 per cent. However, for the mixture you will need ingot metal. It is practically impossible to hit the necessary combination from a miscellaneous pile of scrap.

## To Melt Hot Iron In Small Cupola

We have relined our 42-inch cupola to 38 inches and will appreciate your advice on how to charge this cupola to secure hot iron throughout an average heat of 12,000 pounds. We have tried a 40-inch bed with 800 pounds of iron in the charge and with 90 pounds of coke between the charges. The iron charge is made up of 80 per cent scrap and 20 per cent high silicon pig and a small amount of ferromanganese. We use a fan type blower.

Under normal operating conditions a 38-inch inside diameter cupola should melt approximately 12,000 pounds per hour. Therefore you are not faced with the usual cause of cold iron, viz.: a bridge which develops—where the cupola is not properly slagged—during long heats. An 800-pound iron charge is not excessive for a 38-inch cupola and 90 pounds of coke between charges represents a ratio of 1 to 9. You do not give the blast volume or pressure. This possibly may have a bearing on your problems. For the rated melting capacity of the cupola, the fan should deliver approximately 3000 cubic feet of air per minute at a pressure of 6 ounces.

Character of the charge is not a factor of importance. In fact a scrap charge should melt more easily and rapidly than a charge containing a considerable quantity of heavy pig iron. Any one of several variables may cause cold iron. Hot iron at the beginning of the heat, but gradually growing colder may be due to a proper height bed and insufficient coke between the charges. Cold iron all through the heat may be due to a low bed, but with the proper amount between the charges. A little experimenting usually is required to hit upon the ideal combination. In the present instance we suggest raising the bed 6 inches and placing a double split of coke between the sixth and seventh charges. As an alternative method the iron charge might be reduced from 800 to 600 pounds.

## Finds Segregation In Pulley Face

We find segregation in the V-grooves in pulleys, 60 inches diameter, 2½ inches thick and with faces ranging from 16 to 36 inches. Some of the pulleys are webbed while others have spokes. We place chills under the spokes near the rim in the drag. Castings are gated on the hub with risers on the rim. Segregation is found near the center of the face when the grooves are cut.

A soft spot or porous area at the bottom of a deep cut in the face of a pulley, when found opposite the arms or web, is due to the extra thickness of metal in the vicinity as compared with other parts of the casting. Porous areas in other sections of the casting may be caused by any one of several causes not pertinent to the present discussion. The thick metal remains liquid for a longer period than the metal in the rim above and below or the metal in the arms.

Hence when these parts shrink they draw a certain amount of the metal from the thick section. Later when the thick section solidifies there is no further reservoir on which to draw. As a result, that particular section remains open or porous. This tendency toward segregation in castings where the section thickness varies, is more pronounced with soft than with hard iron. In many instances it is possible to prevent local segregation by a change in the composition of the iron, either by addition of small quantities of nickel and chromium, or by incorporating a certain amount of pig iron containing small amounts of these elements in the charge.

Minor manipulation of the mold in other instances accomplishes the desired result. Chill blocks are placed above and below the arms at the junction with rim. A light chill plate sometimes is placed against the face on the outside. In other instances a short piece of dry sand core is inserted in a print on the outside face to form part of the anticipated groove at that point. Interior chills, spirals, spikes, or short pieces of steel rod may be employed to cool the metal rapidly in the affected area and thus promote uniform shrinkage.

John D. Fenstermacher

J. G. Coffman

Allan S. Austin

Fred Grotts

# MEN of INDUSTRY

FRED GROTTS, formerly vice president, Lebanon Steel Foundry Co., Lebanon, Pa., has joined the Chicago Steel Foundry Co., Chicago, as vice president in charge of heat and corrosion resisting alloys. Mr. Grotts attended the Universities of Illinois and Missouri, graduating from the latter with a degree of bachelor of science in metallurgy and a masters degree in metallurgical engineering. He has been affiliated with the Curtis Aeroplane & Motor Corp., Buffalo; Caterpillar Tractor Co., Peoria, Ill.; and American Steel Foundries, Granite City, Ill. He was connected with the Continental Roll & Steel Foundry Co., Chicago, for 7 years before he joined the Lebanon Steel Foundry Co. While with the Continental company he was metallurgical director of its three divisions: Hubbard Steel Foundry Co., East Chicago, Ind.; Wheeling Mold & Foundry Co., Wheeling, W. Va.; and the Duquesne Steel Foundry Co., Coraopolis, Pa.

♦ ♦ ♦

J. G. COFFMAN, vice president and plant manager, Los Angeles Steel Casting Co. Ltd., Los Angeles, recently has been elected chairman of the Southern California District chapter of the American Foundrymen's association. Mr. Coffman was first employed in 1901 by the Franklin Steel Casting Co., Franklin, Pa. In 1903 he joined the National Malleable Steel Casting Co., and remained with that company until 1911 as head of the melting department. In 1911 he went to the Pacific Coast as melter with the Pacific Coast Steel Co., San Francisco, where he remained for two years. In 1914 he became general superintendent of the Noble Electric Co., Heroult, Calif. From 1915 to 1923 he was with the Southern California Iron & Steel Co. as general superintendent of the open hearth. When that company built a new plant in 1919 Mr. Coffman was superintendent of construction, and after the new plant was placed in operation in 1921 he had charge of the open hearth and electric furnaces. Since that time he has been connected with the Los Angeles Steel Casting Co. Ltd., Los Angeles.

♦ ♦ ♦

JOHN D. FENSTERMACHER, Columbia Steel Co., San Francisco, recently was elected chairman, Northern California chapter of the American Foundrymen's association. Mr. Fenstermacher left high school at the age of 13, and in 1901 was employed by the Bethlehem Steel Co., Bethlehem, Pa. In 1906 he joined the Chester Steel Castings Co., Chester, Pa. where he remained until 1911 when he accepted a position with the Scullin Steel Co., St. Louis, Mo. Mr. Fenstermacher joined the Columbia Steel Co. in 1913.

♦ ♦ ♦

ALLAN S. AUSTIN, associated with the Austin Co., Cleveland, since 1927, the past two years in estimating, general engineering and sales activities, has been named managing director of the new organization to be established in London, England, as the Austin Engineers Builders Ltd. He is a grandson of Samuel Austin, founder of the firm. A complete engineering staff is now being organized under the direction of Albert S. Low, vice president and chief engineer, who has been abroad since May and is remaining in England for several months.

CLAYTON L. FOSTER, member of Austin Co.'s Detroit staff the past 11 years, will head the architectural division of the British firm.

♦ ♦ ♦

GEORGE H. HOUSTON has resigned as president, Baldwin Locomotive Works, Philadelphia, after 10 years of service.

♦ ♦ ♦

H. G. DANIELSON recently joined the sales staff of the Industrial Oven division, American Machine & Foundry Co., New Haven, Conn. He has had 20 years' experience in oven and heating equipment.

♦ ♦ ♦

JACK ANTHONY NACHOWITZ and SIDNEY J. BROOKS have been appointed to Battelle research fellowships in the graduate school of Ohio State university. Mr. Nachowitz, a mechanical engineering graduate of the University of Illinois has received a fellowship in metallurgy, and Mr. Brooks, a graduate of the ceramic engineering department of Ohio State university has been appointed to a fellowship in ceramics.

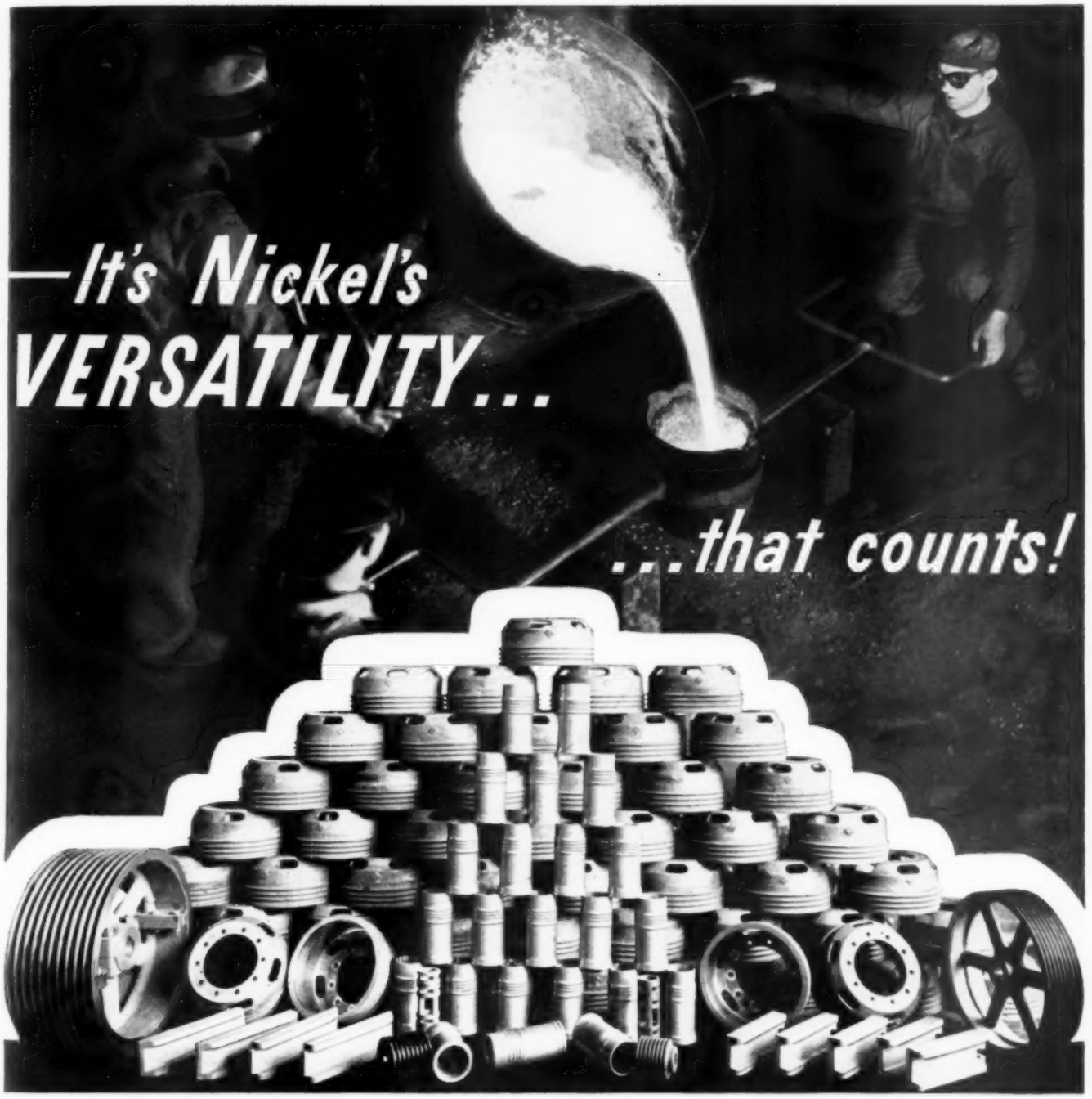
♦ ♦ ♦

ROLAND B. SNOW has become a research engineer at Battelle Memorial institute, and has been assigned to work on ceramics problems. Mr. Snow is a graduate of Ohio State university, where he majored in chemistry and mineralogy, and from which he received the degree of Ph. D. in 1936. For the past two years he has been petrographer on the research staff of Carnegie-Illinois Steel Corp., South Chicago, Ill.

♦ ♦ ♦

ROBERT J. DAVIS recently has been elected president and general manager, Johnston & Jennings Co., Cleveland. Mr. Davis, who has been

(*Concluded on page* 42)




Heat after heat, day in and day out, quality metal comes down the spout—thanks to Nickel, the versatile alloying element. Grey iron castings correctly alloyed with Nickel keep profits from leaking out of the foundry via the scrap pile route where many castings lacking in the desired mechanical properties, density or machinability find their sad ending.

Nickel minimizes porosity and shrinkage, guards against chilled edges and imparts greater strength and toughness. This versatile alloy will give you maximum machinable hardness, will build up resistance to wear, corrosion and heat. Sound castings with uniform structures for applications requiring pressure tightness are profitable castings to make and you can protect these profits by using Nickel's help in rendering a close-grained, dense material.

The assistance of our nearest distributor is available to you—call on their foundry specialist regarding your tough jobs. They, as well as ourselves, will gladly consult with you on any questions concerning the use of Nickel in cast iron, steel or non-ferrous castings.

Pictured above are uniformly sound castings from the plant of the Hesse-Ersted Iron Works, Portland, Ore. Every casting contains Nickel. Brake drums, to withstand wear and heat-checking, contain 1.50% Nickel and 0.50% chromium. Using a 30% steel charge, these drums have a Brinell value of around 260. The Diesel cylinder sleeves are of similar composition but with the steel charge modified. The sheaves are made with a 25% steel charge and contain 0.75-1.00% Nickel. The locomotive shoes and wedges contain 0.50% chromium and 2.00-2.50% Nickel.

**NICKEL CAST IRONS**

**THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.**

(*Concluded from page* 40)

a director of the company the past 2 years, is a grandson of the late Robert Johnston, one of the founders of the business in 1884. Mr. Davis for several years was controller of the Hills Bros. Co., Cleveland. He served as lieutenant in the naval air force during the world war, and was graduated from Amherst college in 1919.

• • •

ADOLPH BREGMAN, managing editor *Metal Industry* since 1919, has severed his connection with that journal to establish an office at 123 William street, New York as consultant in the metal products manufacturing and metal finishing industries. He will specialize on industrial problems, development of products and industrial markets, a field in which he has been engaged for a number of years. He has been executive secretary of the Masters' Electroplating association, New York since 1934 and will retain that position. Mr. Bregman is a member of the Institute of Metals division A. I. M. E. and the American Society for Testing Materials.

• • •

ARTHUR E. SCHUH, formerly with the Bell Telephone Laboratories, has been appointed director of research, United States Pipe & Foundry Co., Burlington, N. J. With headquarters in Burlington, he will be in charge of all research activities for the company. Dr. Schuh was graduated from the University of Chicago, specializing in physical chemistry. Since 1929 he has been associated with the Bell Telephone Laboratories, New York. Previously he was connected with the Western Electric Co., Chicago. Dr. Schuh is a member of the American Society for Testing Materials and the American Chemical society.

• • •

J. E. LINABURY has joined the Saginaw Malleable Iron division of General Motors Corp., Saginaw, Mich., to be in charge of development work. Born in Pontiac, Mich., he graduated from the University of Michigan and joined General Motors in 1909, later leaving to engage in manufacturing and engineering work until 1920 when he rejoined General Motors. In the next 10 years he modernized the Saginaw Malleable Iron division foundry, what later became the Chevrolet Grey Iron foundry and the Cadillac foundry. After this he started the Harrison Radiator division foundry in Lockport, N. Y. In the late twenties he designed the new Buick and Pontiac foundries. Because of ill health he took a leave of absence in 1930 and went to England. Later he returned to this country and took charge of centrifugal casting work for the Campbell, Wyant & Cannon foundry at Muskegon, Mich. Returning to General Motors in 1935, he designed and built grey iron and malleable iron foundries for McKinnon Industries of Canada. He leaves this work to become associated with the Saginaw Malleable Iron division.

# Reader's Comment

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of The Foundry or of Its Editors.*

## High Cost Bell

TO THE EDITORS:

As you no doubt recall, the late Mr. E. Allan Poe on one occasion spread himself to a considerable extent on the subject of bells, silver bells, golden bells, brazen bells what a terror their melody foretells, and iron bells whose clang marks the passing of another individual to the haven under the hill. If Mr. Poe was living today and if the length of a poem was not limited by governmental regulation, we could supply material for an additional verse.

Some time ago at one of the meetings of the Northeastern Ohio chapter of the American Foundrymen's association, Chairman B. G. Parker suggested that the presiding officer would be in much better position to maintain law and order if he could rap a gong instead of the table with the gavel. Other chapters had installed bells for this purpose. Should it be said that the Northeastern Ohio chapter was not peer to any chapter far or near—and—you know, all that kind of stuff.

The suggestion promptly was accepted by our foundry superintendent R. E. Hug. He promised to supply a special cast iron bell with suitable inscription. Shortly thereafter we ran a special heat of bell iron. Remarkably hot sparks from the cupola set the roof of the cupola building on fire, but despite this handicap and the resulting excitement we cast six of the finest cast iron bells we have ever seen (adv) The bell presented to the Northeastern Ohio chapter of the American Foundrymen's association is one the association may well be proud of. It cost $10,779.87!

WILLIAM LOVE

*Colonial Foundry Co.,*
*Louisville, O.*

## What's Ahead?

TO THE EDITORS:

A reader's comment by a young foundryman in a recent issue of THE FOUNDRY interested me to a considerable extent. I see the foundry world as he sees it, but I do not quite agree with his views on the necessity of securing technical data. I am a practical foundryman and have held jobs as foundry instructor and as general foreman in a large jobbing and production shop. I have worked from coast to coast as molder and coremaker and I am only 34 years of age. I am self educated and realize that I am not a sales engineer. At this time I don't believe any one has any thing to write home to mother about. Seems to me Uncle Sam is taking care of that.

After being laid off in January of this year I went to a fair size town in the South and opened a shop of my own. For a cupola I had two upright boilers secured end to end and lined with fire brick. I used coal for fuel and made grate bars and other miscellaneous castings. I made some money in the beginning and could have continued if this recent slump in business had not appeared. Where the laugh comes in I had to walk off and leave my foundry and go to another town to look for a job.

I worked 9 to 10 hours a day, six days a week for $4.00 per day, and had to put up from 15 to 20 molds a day on a side floor. Did my own pouring, shaking out and sand cutting. This foundry was something like the one I had just left. I had my wife and children with me and did not have a dime. Neither did the man who owned the foundry, so I lost the hardest job I ever had.

The young man who wrote the former comment is lucky to keep studying. Rome was not built in a day. Most of the college men I have met are good men. Where you meet one that is not, his height is limited. At present I am living in three little furnished rooms in an eastern town and working as an acetylene welder, but I continue to study and to look for a bright spot in the sky. Generally speaking most foundrymen are real he-men and not as selfish as they appear to be at times. A man cannot give when he has nothing to give, or hardly enough to keep body and soul together.

JUST A READER.

Hammond Machinery Builders, Kalamazoo, Mich., have appointed Mr. Henry M. Wood, 800 Times-Star Tower, Cincinnati, as their representative in the sale of foundry grinders in Southern Ohio, Kentucky, and Southern West Virginia.

# OVER and OVER AGAIN

Flowing back and forth without stop the sand in the hourglass remained long in use, measuring the hours that passed.

Today your black sand, together with Truline Binder*, can be used over and over like the sand in the hourglass.

Let us tell you about this new way to lower costs and obtain greater profits.

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Tell me about reclaimed sand and Truline Binder

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# Poland Is Host to Foundrymen

By VINCENT DELPORT
European Manager, The Foundry

THROUGH the Polish Technical Foundry association, Poland acted as host this year for the annual International Foundry congress. Delegates were present from fourteen countries, including Australia and South Africa. The congress was held under the patronage of the Polish republic president.

The meeting was opened formally Thursday, Sept. 8, by the Minister of industry and commerce representing the government. This meeting and the following technical sessions were held in the Polytechnic School of Warsaw, where the director of the school opened the proceedings with an address of welcome. C. Gierdziejewski, president of the Polish Technical Foundry association presented an interesting summary of the industrial activities of Poland and more particularly of the foundry industry.

Dr. P. Schwietzke, president of the German foundry association spoke on behalf of the foreign delegates in his capacity of president of the International committee of foundry technical association. The minister of commerce and industry expressed the wish that the work of the congress would benefit, not only those present, but the industry as a whole, and expressed his pleasure that the congress was held in Poland. A message conveying the greetings of all those present was sent to the president of the republic.

Thirty-six papers were presented at the technical sessions Thursday, Friday and Saturday. Official exchange papers included one on behalf of the American Foundrymen's association by G. K. Eggleston, metallurgist, Detroit Lubricator Co., Detroit, and chairman of the A.F.A. nonferrous division committee on sand control.

A number of work visits showed that in 20 years Poland has re-created a very active and up to date industry. Some of the foundries, in their equipment and organization, were second to none in other parts of Europe.

Meetings of the International Committee of Foundry Technical association of the International Committee for Testing Cast Iron and of its sub-committees, were held on Sunday, Sept. 11. After the meeting, heads of the foreign delegations deposited a wreath on the tomb of the Unknown Soldier.

On Monday, September 12, the delegates traveled to Cracow, the ancient and historic capital of Poland. Several works were visited while passing through industrial districts. Excursions in the Tatra mountains and other centers of industrial and historical interest were organized during the three following days. The congress met again at Cracow Saturday morning, Sept. 17 for the last technical session. In the afternoon the delegates visited the historical city and attended the closing banquet in the evening. At Warsaw and Cracow the delegates were received by the city presidents.

The congress was a great success and a model of organization through the efforts of Professor Gierdziejewski and his colleagues. As a practical result it may be said that many of the contributions made at the technical sessions have added largely and in a permanent fashion to the literature of foundry science and technology. Once again it has been proved that pooling the experience of foundrymen from every country is of the greatest benefit to the further development and progress of the industry. A more detailed report will appear in a later issue of THE FOUNDRY.

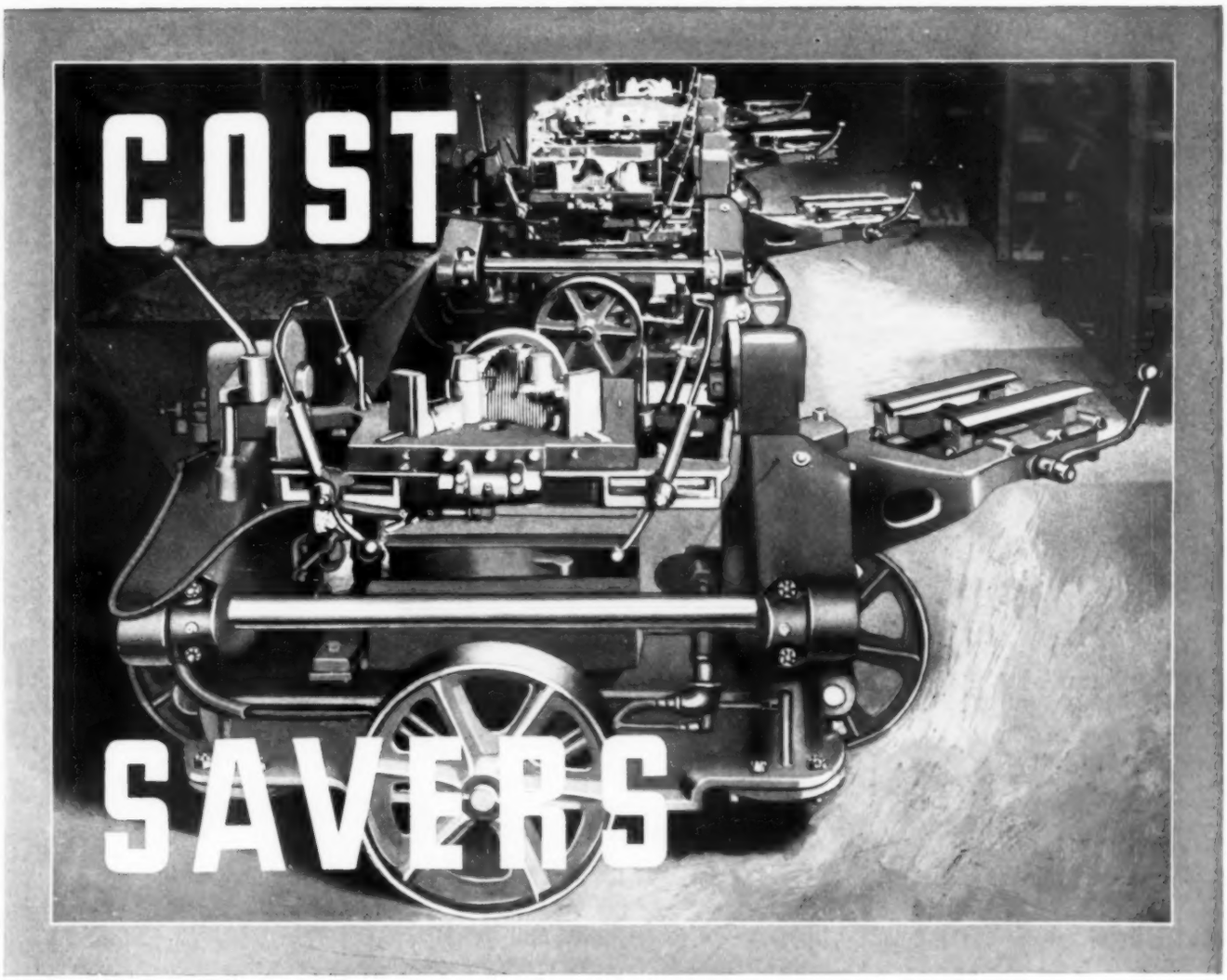
### Open Meeting

*OFFICIALS at the opening meeting of the congress in Warsaw. At the table, second from left, Dr. P. Schwietzke, president of international committee; Minister of industry and commerce; Prof. Gierdziejewski, president of Polish association; Director of the Polytechnic school. On the side are the foreign delegates. Front row: J. Leonard (Belgium), Prof. Portevin (France), S. Brizon (France), V. Delport (U.S.A.), M. Altenstein (Hungary), Dr. Geilenkirchen (Germany). Behind: M. Van Neukirchen and another delegate (Holland) R. Depres (Belgium), T. Makemson (Great Britain), G. Vanzetti (Italy) and other officials.*

### Handles Sales

Julius Lamparzyk, Cleveland, has been made sales engineer in the state of Ohio for the Connecticut Blower Co., Hartford, Conn. Arthur Polston, Louisville, Ky., will handle sales in Kentucky.

Oliver H. Van Horn Co., Inc., New Orleans, has added the complete line of Stanley electric tools to its stock of supplies and equipment for the industrial trade.




Investigate the cost saving advantages of Osborn Moulding Machines. The No. 601 line of Osborn Jolt Rollover Pattern Draw Machines (illustrated) are designed for fast, economical production of medium size moulds. Built in three sizes: 601, 602 and 605 with table lengths of 30″, 36″, and 54″ respectively. The advanced features of these machines meet the needs of modern production and jobbing foundries. Your request for detailed information will receive prompt attention.

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# TIME PROVES VALUES

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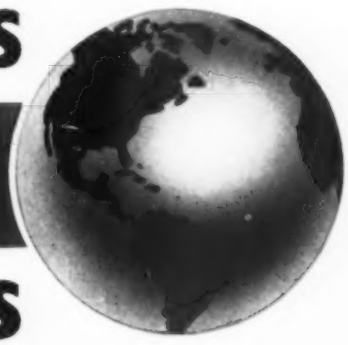
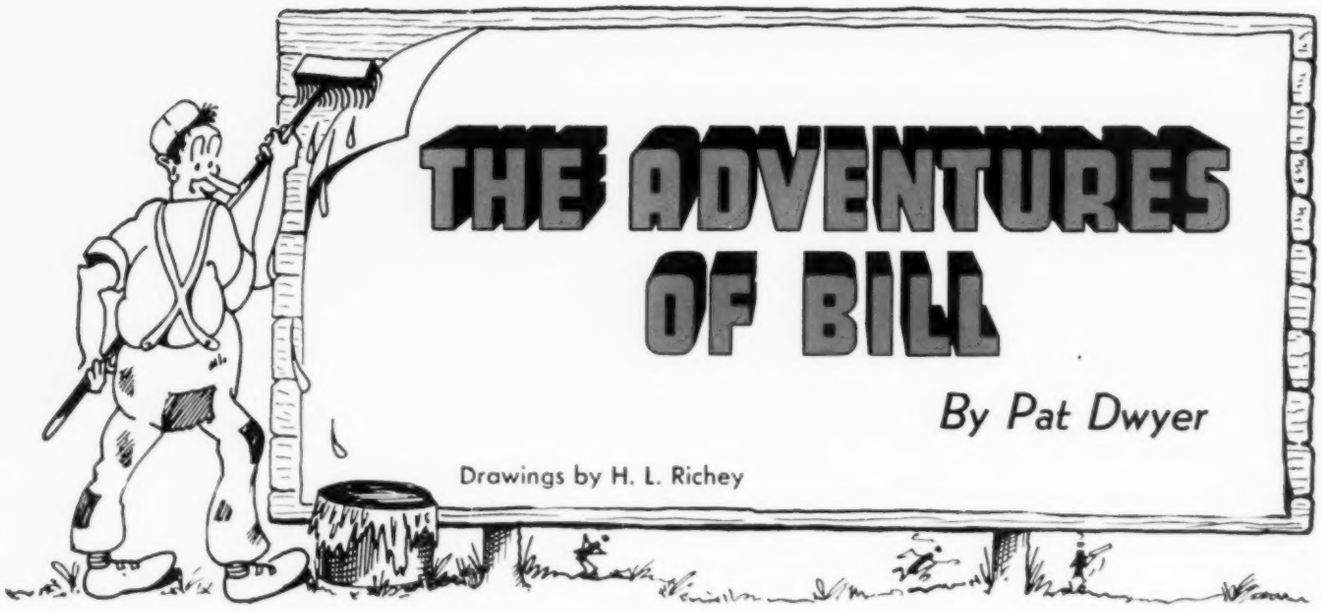


# MOULDING MACHINES



# THE ADVENTURES OF BILL

By Pat Dwyer

Drawings by H. L. Richey

I WONDER," Bill remarked one night recently as he plopped down on the veranda and refreshed himself with a large chew of tobacco. "I wonder if the alleged reluctance of boys to learn the molding trade is not due to some extent to the fact that they have not learned to chew tobacco. Modern young lads learn to smoke quite early in life by sneaking the snipes out of their mother's ash trays, learning at their mother's knee, you might say, but the majority for one reason or another never acquire the more manly art of chewing the weed.

"In the good old days boys commenced chewing tobacco at about the age of ten. Instances of course are on record of young prodigies who cut their first milk teeth on the old man's plug of tobacco. Even in those days fond papas were not above straining the truth occasionally in praise of their offspring, but these instances were exceptional. Taking 10 as a fair cross sectional or average age, teeth all firmly set and stomach like that of an ostrich, the boy gradually worked up from one or two chews per diem, to a stage where he chewed tobacco every waking minute of the day, with a few brief interludes devoted to hastily shoveling the daily allowance of food, any kind of food, into a capacious maw. What was the result?"

"How should I know?" I pointed out quite logically. "That is your story and apparently you are stuck with it. You start off with a young lad chewing tobacco and you end up with the same young glutton stuffed with food to the gills and gasping for air. How does that kind of training fit him for work in a foundry?"

"Your memory," said Bill, "ain't what she used to be. A full meal may and probably does cause you to gasp like a stranded fish, but the only effect it had on one of these healthy young cubs was to arouse curiosity on where and when he was going to get the next meal. Boys under the old regime played hard and ate hard. They started chewing tobacco at the age of 10 and by the time they were 13 or 14 they were tough and strong. They could shovel and pound sand 10 hours a day and then go to a gymnasium at night for a few hours of exercise. Tired? They never were tired, never sick and almost without exception lived to a green old age. The only ones to pop off before their time were the lads who quit the trade to open saloons, grocery stores, start raising chickens, join the police or fire department, or become meter readers for the gas company.

Gent to the right takes no chances

"Under our present paternal educational system a boy is kept in school until he is 18, where he learns to wear a tuxedo, do the big apple and other highly intricate and barbaric dance steps reflecting the minus mentality of the originators, regard the making of dates as a feature of major importance, and any reading outside the funnies and the sport page as a sheer waste of time. In his eighteenth year he is no more concerned with the origin of clothes, food and shelter, than he was with where, when or by whom he was supplied with a milk bottle, a set of assorted safety pins and an occasional squirt of castor oil in his first year. Probably he never read the passage, but he is wholly in accord with at least one item from the *Sermon on the Mount* as recorded by the blessed evangelist Matthew when he wrote nearly 2000 years ago: Consider the lilies of the field, how they grow. They toil not, neither do they spin, and yet Solomon in all his glory was not arrayed as one of these.

"Directly and indirectly he is taught to regard any type of manual labor as something to be avoided as one should avoid any other malignant and contagious disease. To his credit in this respect it must be admitted that he is a willing and earnest student. In the bright lexicon of youth his entire philosophy of life may be boiled down into the familiar and flippantly quoted state-

(*Continued on page* 49)

# OVERWHELMING ACCEPTANCE BY CAR MAKERS

## OVER 80% IN DETROIT AREA USE PENOLYN CORE OIL

## UNIFORMITY WIDELY RECOGNIZED

ALWAYS alert to new efficiencies, to faster production and closer product control, the automobile industry has swung whole-heartedly to Penolyn Core Oil because it has found the common claims of greater workability, minimum gas, speedier cleanout are not the only actual results of using Penolyn. It gets these economies all the time with Penolyn because of its unvarying uniformity.

Throughout the foundry industry this uniformity is observed. Penolyn is relied on for fewer rejects and better castings...real foundry economy. Try Penolyn and see for yourself why it is first choice of critical buyers.

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PITTSBURGH, PA. (Formerly Pennsylvania Lubricating Co.)

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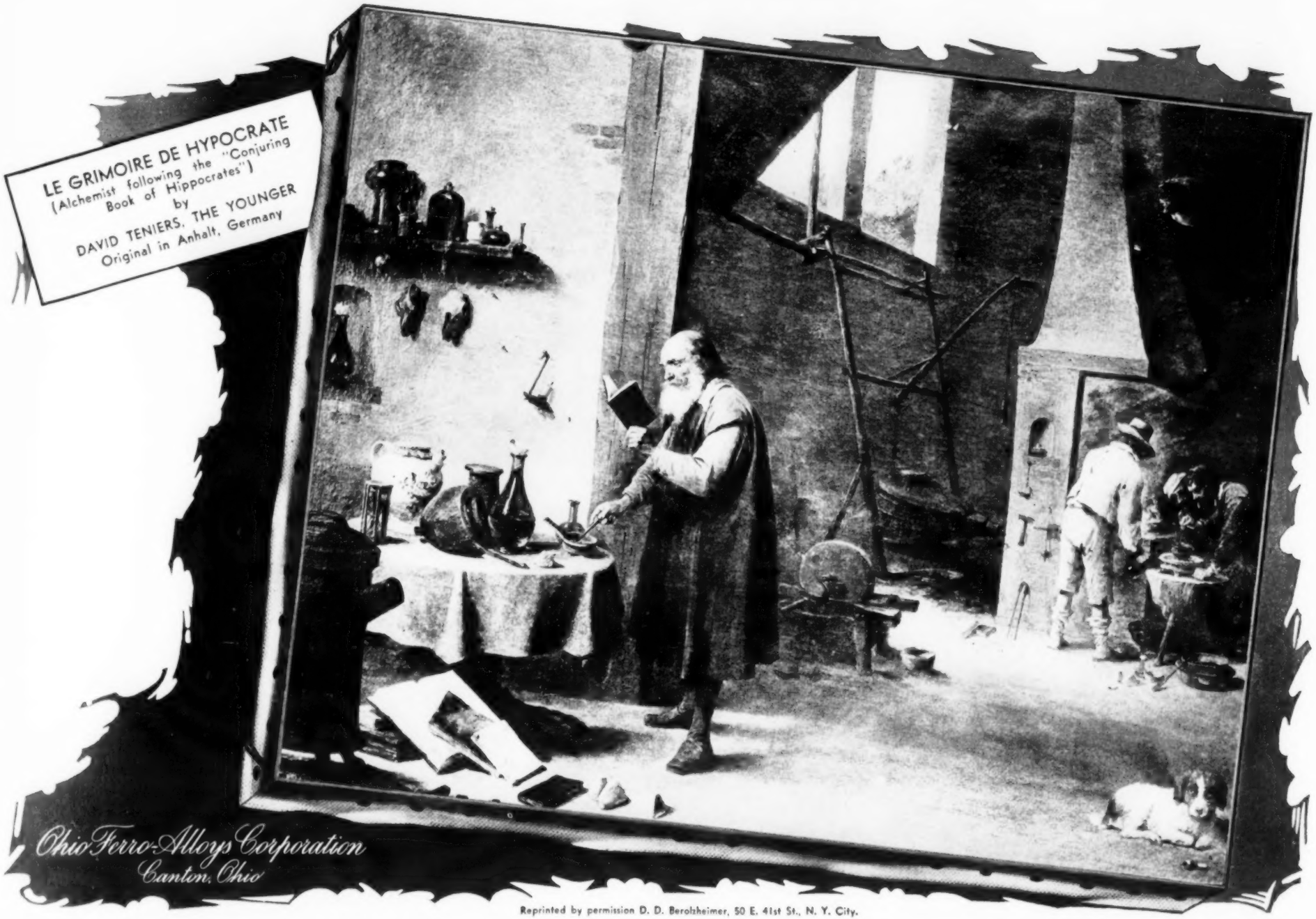


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(*Continued from page* 46)

ment: Only fools and mules work. You are graciously allowed to infer —in direct contradiction to the evidence submitted—that he is neither one nor the other.

"Last but by no means least in any indictment of the factors responsible for the present situation one must include the influence of the loving mother. In the olden days a mother stuffed her chubby little rascal with grub, good, solid grub three or four times a day. As soon as he graduated into long pants she sent him out to look for a job, any kind of a job provided a pay day was attached to it. When he came home and reported that he was to start in next morning as an apprentice in the foundry of the Ajax Foundry & Machine Co. Inc.; Engines, boilers, stoves, General Jobbing and Repair Parts for Agricultural Machinery, the mother wept tears of joy, the younger brothers boldly declared they would go and do likewise in a year or two and the old man brought home an extra can of beer. The boy rapidly learned how to get along with other people. Realized the advantage of team work, discipline, promptness and willingness. Whistled while he worked. Acquired manual skill and dexterity and what is more important gradually absorbed a general knowledge of all the factors involved in the production of castings.

"He learned to accept responsibility, to form his own decisions, to stand upon his own feet, to fight his own battles, to carry his share of the load under any and all circumstances and to pay his own way instead of being a perpetual parasite. Incidentally he always bought his own tobacco."

"To borrow from my favorite radio program," I said, "That ain't the way I heered it Johnny. The way I heered it one feller says to the other feller 'Hey, Red gimme a chew, will ya?' If the other feller happened to have a supply he was willing to oblige, but at the same time he prudently kept hold of the plug with a thumb marking the exact amount he was willing to donate. One foxy lad in those dear old days did not carry his plug in one piece. He chopped it into short takes, each sufficient for a standard chew. When solicited for a chew, he reached into his tobacco pocket, brough up one portion and popped it into his mouth. 'Sorry Cull, last chew I got. Been saving it for the last couple of hours.'

"According to modern standards this indiscriminate borrowing of chewing tobacco was highly unhygienic and insanitary. Even in the old days a man would balk at taking bite for bite with another man from the same sandwich, or at eating from the same plate, but through some obscure reasoning process—or perhaps for lack of reason—he never hesitated at gnawing a chew from the end of a plug formerly gnawed by the owner, any owner. When you come to think of it he laid himself wide open to contagion, infection, microbes, germs of all kind of diseases from arthritis, botts, consumption right down the alphabet to exeema (my own spelling) yellow fever and zinc shakes. I was going to put in silicosis, but that scare has pretty well died out."

**Has a little trouble with his figures**

"Precisely, my dear young fellow. That is just the point in my humble way I was trying to put across. Microbes and germs had about as much chance of getting in their dirty work as boys on the outside have of catching insurance contracts while Jimmy is on the job. In the first place a bath of tobacco juice would kill any microbe that ever crept or crawled. In the second place if one or a party of jolly little scamps survived the bath temporarily, they quickly were annihilated between two rows of strong, crunching teeth.

"Instead of leaving his tobacco in the pocket of a coat hanging on a rusty nail in the wall at the back of the floor, the old time performer carried the plug in his hip pocket. This move was prompted in part by his desire to have it immediately available in any of the trying periods during the day, ramming a big cope, manipulating a feeding rod, or simply relaxing after the wind went on. Other instances might, and usually did arise when the inalienable right to life, liberty and pursuit of happiness suggested a chew as just the thing the doctor ordered. However, a strict regard for the beautiful virtue of truth compels the admission that the move also was prompted by a truly christian desire to take temptation out of the way of any loose fingered lad with a habit of absent mindedly dipping his fingers into other folk's pockets.

"Modern chewers daintily inserting a thumb, first and second digits of the right hand into a scientifically wrapped paper of tobacco would shudder at the naivette, utter disregard of all formality and primitive corn on the cob technique displayed by the old boys. The plug was kept in the hip pocket of an old sweaty pair of pants with shingle nails for buttons, usually torn in several places and thoroughly air conditioned from constant exposure to flying sparks and shots of metal. In addition to serving as a more or less sketchy covering for the person, the pants also was used as a serviette on which the molder wiped accumulations of sand, paste, blacking and claywash from his fingers. In early apprenticeship days a boy might be tempted to wash his hands at the tap before he ate his lunch.

**High school education gives boys and girls poise, dignity and charm**

Even before he was deemed worthy of taking the second of the thirty two degrees leading to Master Molder he was purged of this sissified complex. Thereafter he sat down with the others and either ignored the condition of the hands or merely stropped them lightly once or twice on that section of the pants within easiest reaching distance. In this manner he absorbed a certain amount of roughage with his food. Without any shadow of a doubt a sufficient amount of this inert material remained to put a permanent coating on the lining of the stomach and auxiliary equipment. This anticorrosive lining rendered the old boys immune to the effects of spirituous and malt liquors poured down in quantity sufficient to pickle a graven image.

"Conditions applying to food, applied also, perhaps to a greater extent, to the plug of tobacco, which as you may remember I referred to some time back as reposing in the hip pocket. This pocket also contained a trowel and a double ender. A man working under the crane usually had a 2-foot rule with burned patches on the face, and where the face was not burned only the main gradations were visible to the naked eye. Where it became necessary to work within tolerances of ⅛-inch he had to spit on the rule and then rub the treated portion on the everfaithful old pants leg.

"As a natural result of constant manipulation of the trowel, double ender and 2-foot rule, a sizable mound of sand gradually accumulated in the hip pocket. Consequently so far as cleanliness was concerned the owner might just as well have stuck the plug in the sand pile. The ordinary person, and of course this refers more particularly to the borrower, paid no attention to the dusty and grimy piece of tobacco. He snapped a bite before the donor had a chance to change his mind. Later, in the mastication of the pulp he gradually eliminated the dust, the lint, the grit and the sand grains.

"The owner of the plug usually was a trifle more fastidious. When about to nip off a morsel for himself, or on the comparatively rare occasions when he was moved to offer a chew to a friend, he invariably either blew away the accumulated dust with a mighty breath, or scraped it off by friction against a horny palm. Courtesy could do no more."

"Courtesy, eh? Did you ever hear of the girl who vowed to her friend that never again would she slap the face of a fellow who offered or threatened to kiss her? Do you know why? I'll tell you why. The last fellow she slapped had been chewing tobacco and she made a slight error in her timing."

# Patterns Must Be Good

(*Concluded from page* 28)

metal pattern castings with a smooth finish where they will not be machined, then white pine should be used where possible for the master patterns. It will keep its shape for a long period and the castings obtained from it will be much smoother especially in filed finish jobs.

If the master pattern is to be used from time to time and stored in the vault most of the time, Mexican mahogany where possible should be used. Experience shows that maple although used in some places is a very unsatisfactory material for making patterns. No matter how well maple is selected and dried, it still has a great affinity for moisture in the foundry. On maple patterns made with the greatest care we have seen well glued joints drawn apart by the powerful action of the foundry atmosphere. We are opposed quite definitely to maple as pattern material.

Flake glue is the best we have been able to obtain. Five cents worth of glue may hold together fifty dollars' worth of labor. Our policy is to buy high grade, satisfactory glue and stay with it. However, bear in mind that the best glue will start deteriorating after it has been melted 48 hours. Even with the best glue, the glue pot should be cleaned every day and fresh glue put in. This practice will pay big dividends. Never permit the glue to reach a temperature over 185 degrees Fahr. Temperature beyond that point will break down the finest fibered glue ever manufactured. There are wonderful electric glue pots on the market today where the temperature is thermostatically controlled. There is no excuse for furnishing men with glue that is not properly suited to a real pattern shop.

Shellac, another very important commodity in the pattern shop, has caused the foundrymen a great deal of grief especially in summer from June to September. Humidity during that period is unusually high and alcohol has a great affinity for moisture. If shellac pots are left open any length of time, especially during those months, the shellac will take up sufficient moisture to retard or eliminate entirely the drying of the shellac on the patterns. Shellac pots should be kept clean and always properly covered. We use a grade *A* orange flake shellac, free from rosin and not bleached with arsenic after the manner of many light colored shellacs. No. 5 formula of methanol manufactured by the United States Industrial Alcohol Co. is used for cutting. Use of oxalic acid in connection with shellac represents bad practice. It makes the shellac rather sticky and also retards the shellac drying on the patterns.

## To Add Nine Sizes

Current revision of simplified practice recommendation R154-34, cupola refractories, has been accorded the required degree of acceptance by the industry, and is to become effective Oct. 1, 1938, according to an announcement of the division of simplified practice, National bureau of standards. The revised recommendation will be identified as simplified practice recommendation R154-38.

This recommendation lists stock sizes of 6, 9, and 4½-inch cupola blocks, and tap-out and slag-hole blocks. Originally approved by a general conference of producers, distributors, and users in 1932, and modified to accord with certain suggestions received upon its submission to the industry for consideration, it became effective March 1934.

The present revision adds nine sizes of 6-inch cupola blocks for diameters larger than formerly listed, a new schedule of twenty 9-inch blocks for outside diameters ranging from 66 to 168 inches, and eight 4½-inch blocks for outside diameters ranging from 25 to 82 inches.

Until printed copies are available, mimeographed copies may be obtained from the division of simplified practice, National Bureau of Standards, Washington.

## Issues Yearbook

United States department of the interior has published the *Minerals Yearbook,* 1938, which presents an economic and statistical review of developments in the mineral industry in 1937, and carries forward the annual surveys of the mining activities of the country which were inaugurated more than 70 years ago. Part I, a survey of the mineral industries, contains a statistical summary of American and world mineral production; Part II, a report of metal production and use, contains detailed statistics on use and production by countries and states; Part III deals with nonmetal minerals. The yearbook may be ordered from the superintendent of documents, government printing office, Washington.

# MAXIMUM PERFORMANCE

## *that's what you get with* STERLING FLASKS

Maximum performance is not a hit or miss proposition.

Whether it be in sports or the manufacturing of a product, maximum performance is the result of careful research together with careful planning.

Great torsional strength, minimum weight, and higher efficiency, were not arrived at by "I hope we hit it" methods.

Behind these three important factors is a story of diligent research and planning. And on the strength of that research and planning we built a flask that boosts your profits, cuts down your production costs, and gives you maximum performance.

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# Chapters To Hold Three Conferences

Old State capitol building located at the University of Iowa, Iowa City

THREE regional conferences, sponsored jointly by chapters of the American Foundrymen's association and local groups of foundrymen, will be held during October at technical schools throughout the Mid-West.

The second foundry conference of the St. Louis chapter of the A.F.A., the Missouri School of Mines and the A.F.A. will be held at Rolla, Mo., Oct. 7 and 8. Advance interest indicates that a large group of foundrymen will be in attendance at all sessions.

Tentative program of the two-day meeting is as follows:

**Friday, Oct. 7**

MORNING

Registration, Metallurgy building

9:30—12 a.m., *Cupola Practice*, Parker hall
Chairman, George W. Mitsch, American Car & Foundry Co., St. Louis.
Mechanical Charging with Cupola Control as Practiced at the Caterpillar Tractor Co., by M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill.
Operation of Hot Blast Cupola, by A. O. Nilles, Griffin Wheel Co., Kansas City, Kans.

9:30—12 a.m., *Nonferrous and Malleable*, Metallurgy building
Chairman, J. O. Klein, Southern Malleable Iron Co., East St. Louis, Ill.
Malleable Iron, Its Composition and Manufacture, by Leon Wise, chairman, Research and Development committee, Malleable Founders' society.
Short Cycle Annealing, by Hyman Bornstein, Deere & Co., Moline, Ill.
Choosing and Using Nonferrous Alloys, by J. W. Kelin, Federated Metals Division, A. S. & R. Co., St. Louis.

AFTERNOON

Luncheon, Hotel Edwin Long
Address by District Chapter Chairman
Safety in Foundries, by J. O. Johnson, American Optical Co., St. Louis.

2—4:30 a.m., *Sands and Refractories*, Parker hall
Chairman, L. C. Farquhar, American Steel Foundries, East St. Louis, Ill.
Address of Welcome, by William R. Chedsey, Director, Missouri School of Mines, Rolla, Mo.
Testing and Control of Molding Sands, by H. W. Dietert, Harry W. Dietert Co., Detroit.
Molding Sand Problems in the Foundry, by Horace Deane, Deere & Co., Moline, Ill.
Limitations of Refractories for Foundry Use, by M. C. Booze, Charles Taylor Sons Co.
Refractories from Missouri Clays, by C. M. Dodd, professor, Missouri School of Mines, Rolla, Mo.

EVENING

Dinner, Pierce Pennant hotel
Chairman, George S. Haley, Century Foundry, St. Louis.
Speaker, L. P. Robinson, Werner G. Smith Co., Cleveland

**Saturday, Oct. 8**

MORNING

9—12 a.m., *Gray Iron and Metallography*, Parker hall
Chairman, C. R. Culling, Carondelet Foundry Co., St. Louis, and president, Gray Iron Founders' Society.
Limitations of the Spectrograph, by S. R. B. Cook, professor, Missouri School of Mines, Rolla, Mo.
Practical Application of Metallography, by Carl H. Morken, Carondelet Foundry Co., St. Louis.

9—12 a.m., *Steel*, Metallurgy building.
Chairman, W. Carter Bliss, Scullin Steel Co., St. Louis.
Manufacture of Steel Castings for High Pressure, High Temperature Service, by Lee Everett, Key Co., East St. Louis, Ill.
Blow Holes in Steel Castings, by Joseph D. Walsh, Scullin Steel Co.

AFTERNOON

Football Game, Missouri School of Mines vs. Chillicothe Business college.
Golf.

Third annual foundry conference at the State University of Iowa, Iowa City, Iowa, Oct. 14 and 15, will be sponsored by the Quad City chapter of A.F.A. the Northern Illinois and Southern Wisconsin chapter of the A.F.A., the State University of Iowa, and the Northern Iowa Foundrymen's association.

The announced program of the conference is as follows:

**Friday, Oct. 14**

MORNING

9:00 a.m.
Registration, Chemistry Building. All sessions will be held in the Chemistry Auditorium.

9:30 a.m.
*Opening Session.*
Chairman, P. T. Bancroft, Moline, Ill.
Address of Welcome, by Dean F. M. Dawson, College of Engineering.

10:00 a.m.
*Practical Sand Problems and Their Remedies.*
Chairman, R. Holland, International Harvester Co., Rock Island, Ill.
Core Room Problems, by L. P. Robinson, Werner G. Smith Co., Cleveland.
Curing Casting Defects Due to Sand, by H. W. Dietert, Harry W. Dietert Co., Detroit.

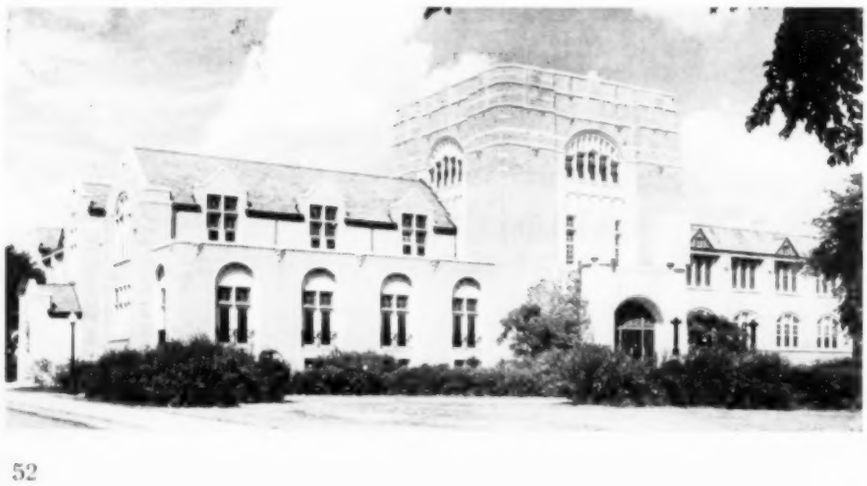
AFTERNOON

12:30 p.m.
Luncheon, River Room, Iowa Union Building.

2:00 p.m.
*Practical Metal Problems and Their Remedies, Nonferrous Section.*
Chairman, H. E. Alex, Rock Island Arsenal, Rock Island, Ill.
Defects in Nonferrous Castings, by C.

(*Concluded on page* 55)

Purdue Memorial Union in which the sessions of the Chicago Chapter Conference will be held



(*Concluded from page 52*)

V. Nass, Fairbanks Morse Co., Beloit, Wis.

Intermission

3:30 p.m.

*Practical Metal Problems and Their Remedies, Gray Iron Section.*

Chairman, A. E. Hageboeck, Frank Foundries Corp., Moline, Ill.

Producing Good Gray Iron, by M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill.

EVENING

6:30 p.m.

*Conference Dinner*, River Room, Iowa Union Building.

Presiding, H. O. Croft, Department of Mechanical Engineering, State University of Iowa, Iowa City, Iowa.

Speaker, H. Bornstein, Director and Past President, American Foundrymen's Association and Director of Laboratories, Deere & Co., Moline, Ill.

Speaker, Eugene Gilmore, President, State University of Iowa, Iowa City, Iowa.

**Saturday, Oct. 15**

MORNING

*Equipment Problems and Methods.*

8:30 a.m.

*Pattern Section.*

Chairman, John H. Ploehn, French & Hecht, Inc., Davenport, Iowa.

Pattern Problems, by J. E. Kolb, Caterpillar Tractor Co., Peoria, Ill.

9:40 a.m.

*Refractories Section.*

Chairman, John H. Diedrich, Blackhawk Foundry & Machine Co., Davenport, Iowa.

Monolithic Linings, by R. E. Wilke, John Deere Tractor Co., Waterloo, Iowa.

10:30 a.m.

*Molding Section.*

Chairman, Fred W. Kirby, John Deere Spreader Works, East Moline, Ill.

Molding Equipment, by W. R. Jennings, John Deere Tractor Co., Waterloo, Iowa.

AFTERNOON

*Recreation—Golf.*

Chicago chapter of the A.F.A. will hold its first regional conference Oct. 27, 28 and 29 at Purdue university, Lafayette, Ind., under the joint sponsorship of the chapter and the university. It is anticipated that a considerable number of foundrymen from Indiana and Illinois will be present.

A tentative program for the three-day meeting is as follows:

**Thursday, Oct. 27**

MORNING

Registration, Union building lobby.

General Session, Union ball room.

Address of Welcome:

In Behalf of University—Dean A. A. Potter, Dean of Engineering, Purdue University.

On Behalf of Chicago Chapter—L. H. Rudesill, Griffin Wheel Co., Chicago, Ill., Chairman, Chicago Chapter of A.F.A.

On Behalf of A.F.A.—R. E. Kennedy, Secretary, A.F.A.

Announcements.

*Gray Cast Iron Technical Session*

Technical Chairman, H. K. Briggs, Western Foundry Co., Chicago.

Subject, Cupola Raw Materials.

Raw Materials, by R. H. Bancroft, Perfect Circle Co., Hagerstown, Ind. (Tentative).

Coke, by B. P. Mulcahy, Citizens Gas & Coke Utility, Indianapolis.

Materials Handling, by E. L. Reed, Whiting Corp., Harvey, Ill.

Refractories, by Carl Wirth, Terre Haute Malleable & Mfg. Co., Terre Haute, Ind.

*Malleable Iron Technical Session*

Technical Chairman, L. H. Rudesill, Griffin Wheel Co., Chicago.

Subject, Melting Practices and Materials of Melting.

Conventional Air Furnace, by P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill.

Duplexing, by J. O. Klein, Southern Malleable Iron Co., St. Louis.

Brackiesburg Furnace, by J. H. Lansing, Malleable Founders' society, Cleveland.

*Steel Technical Session*

Technical Chairman, C. E. Westover, Burnside Steel Foundry Co., Chicago.

Subject, Manufacture of Steel Castings.

Manufacture and Application of Steel Castings (Illustrated Lecture — Students Invited), by H. A. Forsberg, Continental Roll & Steel Foundry Co., East Chicago, Ind.

AFTERNOON

Luncheon, Union building cafeteria.

*Gray Cast Iron Technical Session*

Technical Chairman, G. P. Phillips, International Harvester Co., Chicago.

Cupola Melting Operations, by John L. Lowe, melting superintendent, Centrifugal Fusing Co. Division, Campbell Wyant & Cannon Foundry Co., Lansing, Mich.

*Malleable Technical Session*

Technical Chairman, B. C. Yearley, National Malleable & Steel Casting Co., Chicago.

Subject, Annealing Practices.

Conventional Practice, by L. E. Roby, Jr., Peoria Malleable Iron Co., Peoria, Ill.

Pressure Type Practice, by C. C. Lawson, Wagner Malleable Iron Co., Decatur, Ill.

Short Cycle Practice, by W. D. McMillan, International Harvester Co., Chicago.

*Steel Technical Session*

Technical Chairman, Bert Aamodt, National Malleable & Steel Casting Co., Chicago.

Subject, Methods of Melting.

Converter, by F. B. Skeates, Link-Belt Co., Chicago.

Electric Furnace, by Al. Gierach, American Manganese Steel Co., Chicago Heights, Ill.

Open-Hearth, by John W. Porter, American Steel Foundries, East Chicago, Ind.

EVENING

Dinner, Union building ball room.

Presiding Officer, L. H. Rudesill, Griffin Wheel Co., Chairman, Chicago Chapter of A. F. A.

Speaker, Dr. J. L. Bray, head, School of Chemical and Metallurgical Engineering, Purdue University.

Entertainment, Purdue Glee Club.

**Friday, Oct. 28**

MORNING

*Gray Cast Iron Technical Session*

Technical Chairman, J. D. Burlie, Western Electric Co., Chicago.

Subject, Casting Defects, Causes and Remedies.

Casting Defects Other than Sand, by Martin Lefler, Oliver Farm Equipment Co., South Bend, Ind.

Casting Defects Due to Sand, by A. W. Weston, Chicago Hardware Foundry Co., North Chicago, Ill.

Discussion on Hot Sand Theory, by M. A. Scott, Greenlee Foundry Co., Chicago.

*Malleable Iron Technical Session*

Technical Chairman, G. B. Stantial, Illinois Malleable Iron Co., Chicago.

Subject, Casting Defects, Their Causes and Remedies.

Speaker, L. F. Hartwig, Chicago Malleable Castings Co., Chicago.

Speaker, H. W. Dietert, H. W. Dietert Co., Detroit.

*Steel Technical Session*

Technical Chairman, A. W. Gregg, Whiting Corp., Harvey, Ill.

Casting Design, by C. W. Briggs, Steel Founders Society of America, Cleveland.

Steel Casting Properties, by F. A. Melmoth, Detroit Steel Casting Co., Detroit.

AFTERNOON

Luncheon, Union building cafeteria.

*General Session*

Technical Chairman, L. F. Lottier, Peoples Gas, Light & Coke Co., Chicago.

Metallography for the Practical Foundryman, by Prof. R. L. Farabee, Purdue university, Lafayette, Ind.

**Saturday, Oct. 29**

Demonstrations.

Rapid Methods of Chemical Analysis. Spectrographic Analysis; Rapid Chemical Analysis.

Physical Testing, under direction of Prof. R. B. Crepps.

Tensile Strength; Yield Point; Transverse Strength; Deflection; Impact Testing; Torsion; Bending.

## Book Review

*Hot-Dip Galvanizing Practice*, by William H. Spowers Jr., fabrikoid, 189 pages, 6 x 9 inches, published by Penton Publishing Co., Cleveland, and supplied by THE FOUNDRY, Cleveland, for $4, and in Europe by the Penton Publishing Co. Ltd., London.

While this book is concerned primarily with hot-dip galvanizing of various types of steel products, containing only one chapter on galvanizing cast pipe fittings, the broad field covered, and the detailed information given, make it one that should be in the library of every galvanizer. The book is divided into 23 chapters of which the first gives a brief history of galvanizing. Chapter II discusses principles of zinc coating metal and is followed by one on reduction of dross losses. Progress in kettle installation and straight-wire galvanizing are described in chapters IV and V while the next three chapters relate to tight-coated wire, galvanizing of poultry netting and hardware cloth, and galvanizing of pipe.

Chapter IX describes galvanizing of sheets, and galvanizing of pipe fittings is the topic of chapter X. Galvanizing of stamped metal ware is covered in chapter XI while chapter XII relates to galvanizing of range boilers and barrels. Chapters XIII, XIV, XV, XVI, and XVII describe respectively a permanent galvanizing kettle, control of oxidation and radiation, fluxing materials, chemical reactions of fluxes, and principles of fluxing. Remaining chapters cover flux washes and preparation, zinc ammonium chloride, pyrometry and various types of pyrometers. The book contains an excellent bibliography of literature, and a well arranged cross index.

American MonoRail Co., Cleveland, has opened a sales and engineering office at 549 West Washington boulevard, Chicago. H. L. Bushman has been appointed manager of the new division.

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*The Carborundum Brand*
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**"ALFRAX"**
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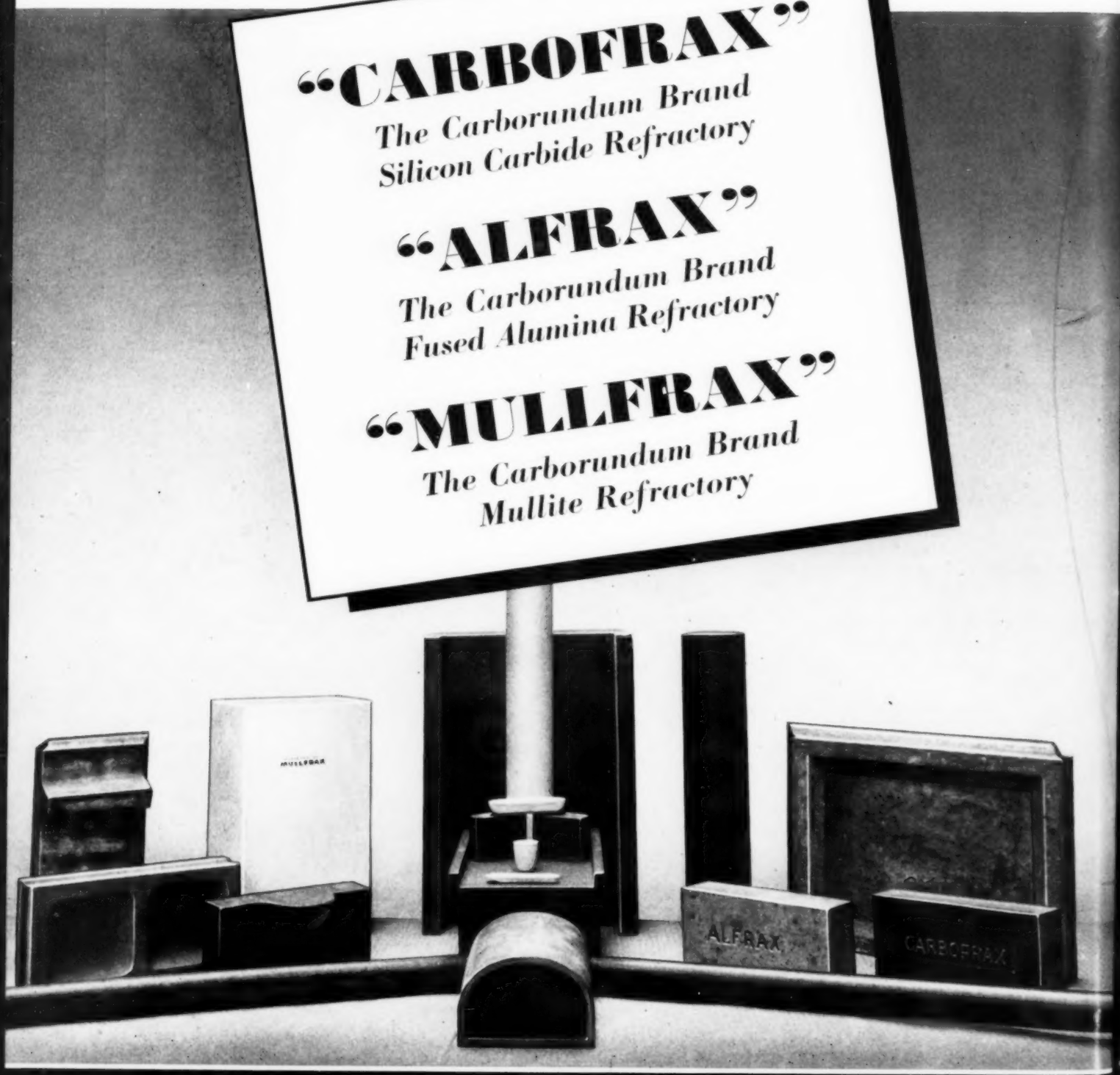


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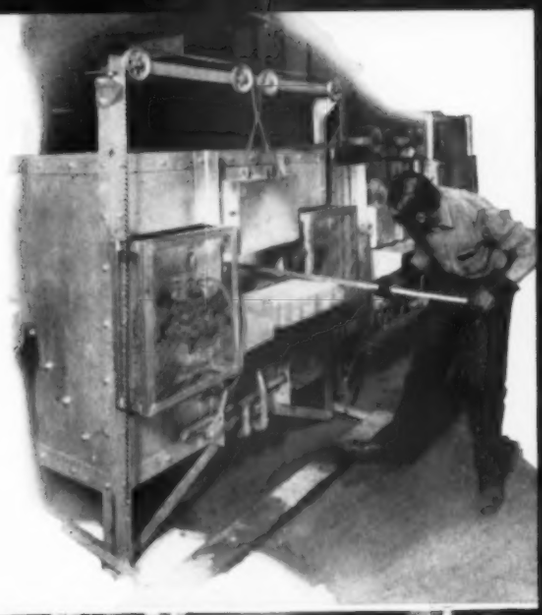
# REFRACTORIES

## IN LOWERING YOUR COSTS



CARBORUNDUM'S three great super refractories have played an important part in reducing both production and refractory costs throughout practically every branch of the metal working industry. These refractories are speeding up production and improving the quality of heat treating products for hundreds of users all over the world.

"Carbofrax," "Alfrax" and "Mullfrax" super refractories are used in the form of muffles, hearths, supports or complete linings in all types of furnaces. Among them may be mentioned furnaces for forging, drawing, tempering, hardening, carburizing and annealing; for sintering tungsten carbide; and furnaces for both ferrous and non-ferrous melting.

In general, the outstanding success of these super refractories in lowering costs is due to the fact that each of them has one or more of the following five important characteristics: (1) They are very resistant to high temperatures, (2) They have extremely high heat conductivity, (3) They are not affected by sudden temperature changes, (4) They stand up under punishing abrasion, and (5) They withstand corrosion and erosion of metals and slags.

We welcome at any time a discussion of your problems and an opportunity to point out how Carborundum's refractories can help you reduce costs. Our representatives will be at Booth A-509, National Metal Congress, Detroit.

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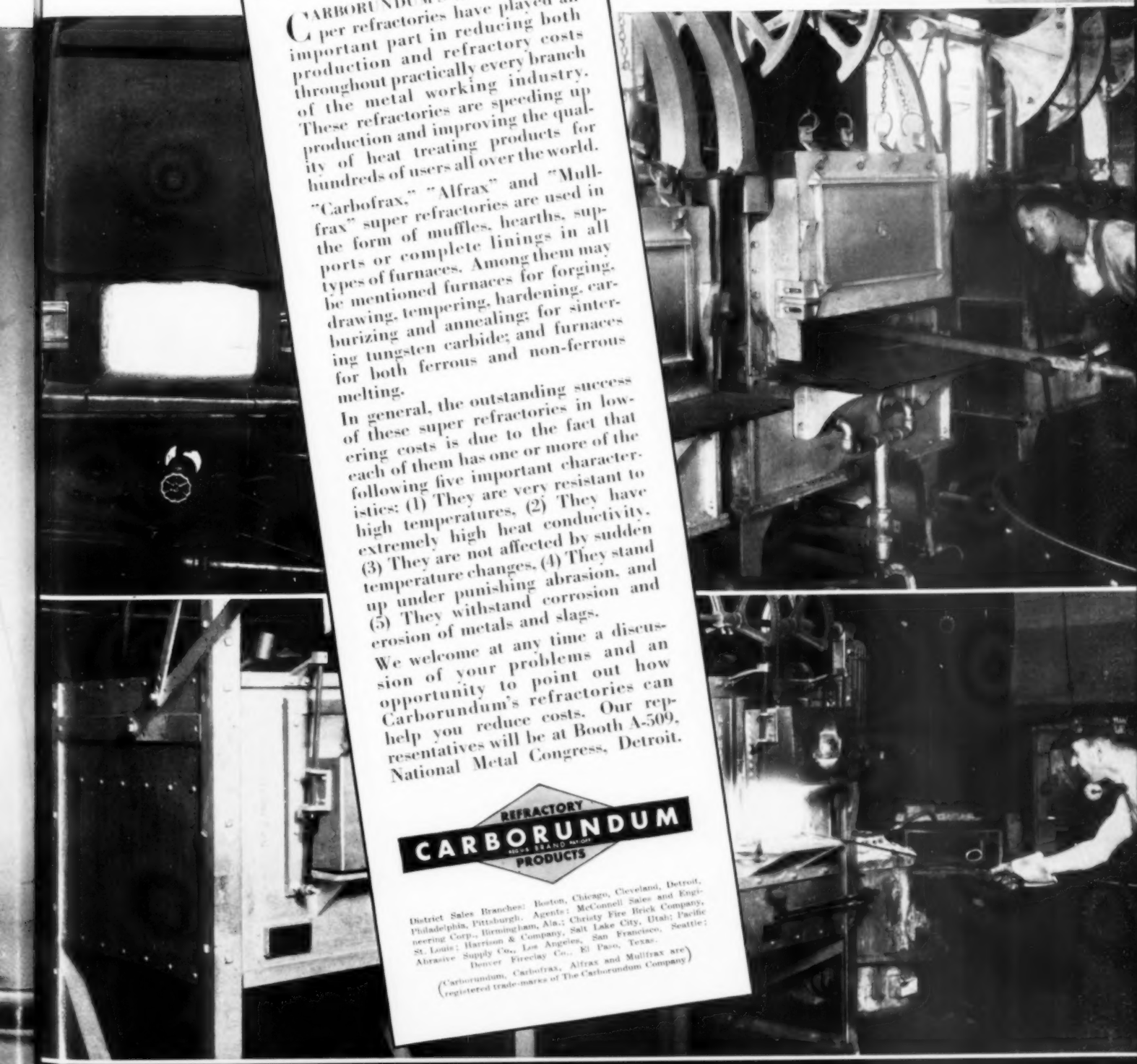


REFRACTORY DIVISION, PERTH AMBOY, N. J.

# ACTIVITIES OF FOUNDRY GROUPS

## Southern California

THE first annual stag picnic of the Southern California chapter, of the A.F.A. was held at the Lakewood country club, Aug. 20. A group picture of those in attendance is presented on page 38 of this issue, while the committee is shown on this page.

The program included tennis, golf and a ball game in the afternoon followed by a stag dinner and floor show in the evening. The entertainment committee included the following: W. F. Haggman, Foundry Specialties Co., chairman; J. G. Eberhart, Kay Brunner Steel Products; W. D. Bailey Jr., Pacific Metals Co.; S. Moscny, Independent Foundry Supply Co.; D. C. Murray, H. C. Donaldson Co.; Richard S. Smith, Cook Heat Treating Corp.; S. S. Brown, H. L. E. Meyer Jr. & Co.

## St. Louis

RECORD attendance featured the meeting of the St. Louis chapter of the A.F.A. held Sept. 15 at the Mark Twain hotel, St. Louis. Almost 100 A.F.A. and American Society for Metals members and friends were present at the joint meeting, the first of the current year. J. O. Klein, Southern Malleable Iron Co., St. Louis, and chairman of the foundry chapter, gave a brief review of various committee and chapter activities and extended a cordial welcome to the many visitors as well as to the officers and members of the A.S.M.

R. Stifel, chairman of the membership committee, announced the applications of four new members: C. M. Adkinson, C. L. Clemans, Charles V. Sharritt, and A. C. Shelton, all associated with the Key Co., East St. Louis, Ill. L. Desparois, chairman of the Rolla conference committee, outlined program and plans for the Rolla meet. J. O. Klein, chairman of the chapter, announced the appointment of the following committee chairmen: Membership committee, R. Stifel; apprentice training committee, C. R. Culling; finance committee, J. W. Kelin; entertainment and greeting committee, R. K. Durkan; and program committee, Webb C. Kammerer.

Harry Guilbert, director of safety and compensation, Pullman Standard Car & Mfg. Co., Chicago, was the speaker of the evening. He spoke on safety, both in the foundry and in other industries.—*John W. Kelin, secretary-treasurer.*

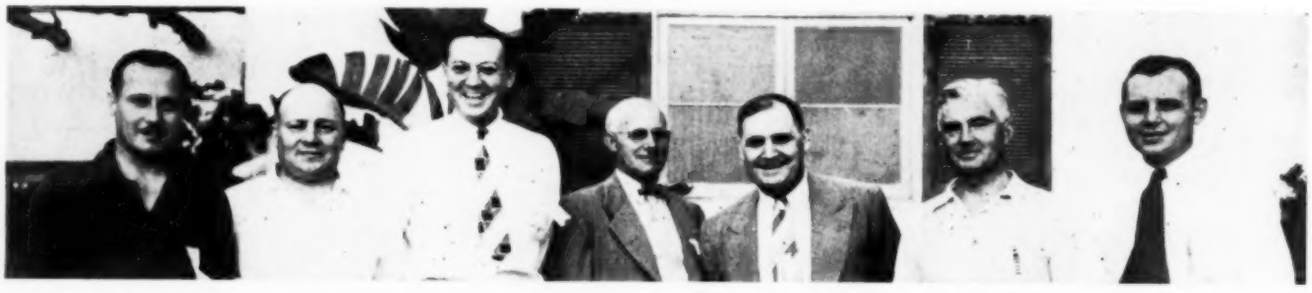
## New England

APPROXIMATELY 55 members and guests of the New England Foundrymen's association attended the "Fathers and Sons night" of the association, held at the Engineers club, Boston, Sept. 14. Several members entertained their sons as guests of the evening, and places were reserved for the young men at the head table.

Burton L. Gray, in charge of the Washburn shops, Worcester Polytechnic institute, Worcester, Mass., spoke on the subject of "Opportunities for Young Men in the Gray Iron Foundry." He discussed the various types of foundries, both ferrous and nonferrous, throughout the country, and analyzed the future for young men with steel, gray iron, and malleable producers. Mr. Gray said that there were about 3300 gray iron foundries in the United States, probably representing an investment of more than a billion dollars. Of the 300,000 men employed by this industry, he said that a conservative estimate would set the yearly replacement at about 15,000 men. There is, therefore, always opportunity for the young man with proper training.

During the discussion which followed Mr. Gray's address, Henry A. Jensen, association president, called upon the following men for a statement of their opinions: Thomas Curtin, Waltham Foundry Co., Waltham, Mass.; Robert Bonner, Bonner Foundries, Cambridge, Mass.; Henry Bluemenauer, Arcade Malleable Iron Co., Worcester, Mass.; A. B. Root Jr., Hunt-Spiller Mfg. Corp., Boston; R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston; and E. H. Ballard, General Electric Co., Lynn, Mass. They agreed, generally, that the foundry industry provided a real

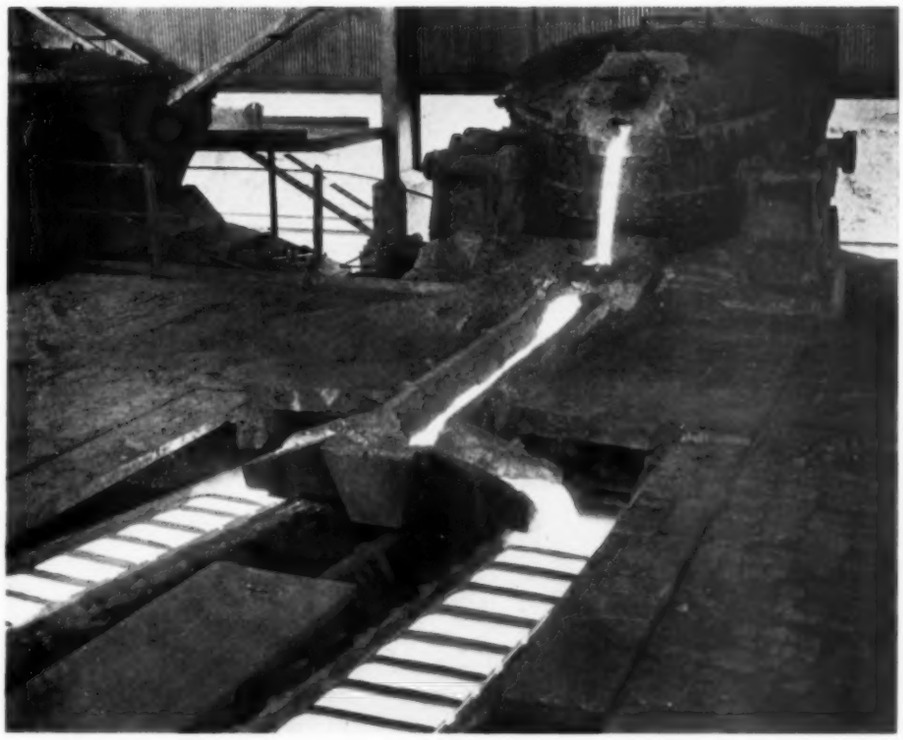
(*Concluded on page* 60)



**Members of the entertainment committee for the first annual stag picnic of the Southern California chapter of the A. F. A. From left to right R. S. Smith, W. F. Haggman, chairman, W. D. Bailey Jr., J. G. Coffman, chairman Southern California chapter, J. G. Eberhart, S. S. Brown, and D. Z. Murray**

# *Uniformity* OF WOODWARD IRON IS DUE TO THE "FOLLOW THROUGH"

IT'S the "follow through" in golf that gives the distance to the swing. And it's the "follow through" in every cycle of production of WOODWARD IRON which accounts for that consistent uniformity for which this iron is so famous in the foundry trade.



## BY *"Follow Through"* WE MEAN:

USE of identical ores with the base ore burden always from the same ore body—fast burning Pratt Coke which gives more complete reduction of the Red Mountain ore—accurate control of analysis within narrow limits—modern methods in the field of furnace practice—close laboratory controls and checks—and good service which follows through until the finished product is delivered to the customer.

Most foundries which place an initial order for uniform Woodward iron follow through with many more. And so will you, when you have had the opportunity to prove to your own satisfaction how Woodward iron can help you standardize precise control of quality in the production of your castings.

**WOODWARD IRON COMPANY**
**WOODWARD, ALABAMA**

*America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer*

(*Concluded from page* 58)
opportunity for young men who were willing to put time, study and hard work into their future profession.—*M. A. Hosmer.*

## Northeastern Ohio

APPROXIMATELY 60 men attended the first fall meeting of the Northeastern Ohio chapter of the A.F.A. held Sept. 8 at the Cleveland club, Cleveland. Leroy P. Robinson, Werner G. Smith Co., Cleveland, and chairman of the chapter, presided. After announcing his committee appointments for the coming year, Mr. Robinson introduced F. G. Metzger, Cleveland Quarries Co., Cleveland, who described the quarrying and fabrication of silica firestone.

Motion pictures which illustrated Mr. Metzger's talk showed the drilling, cutting, and hoisting of stone from the vast Ohio silica deposits. The shaping and fabrication of the stone in the mills was described by Mr. Metzger as it was shown on the screen. Many uses for sandstone have been found in the building industry, he said, and many statues and structures erected with the stone twenty or thirty years ago have not been damaged by erosion.

Mr. Ray Faller, Ethyl Gasoline Corp., New York, described problems of engineers who design high compression internal combustion engines. It has been found, he said, that ordinary fuels break down under the high pressure and temperature of the combustion chamber of the high compression engine. Such fuels ignite unevenly, creating knock and destructively wasted power. With slow motion pictures, Mr. Faller showed the effect of small additions of lead tetraethyl to high quality gasolines.

## Pittsburgh

THE opening meeting on the fall schedule of the Pittsburgh Foundrymen's association was held Sept. 19 in the Norse room, Fort Pitt hotel. This marked the first meeting under the direction of the new officers, Otto Nadolny, Duquesne Pattern & Bronze Co., president and chairman of this meeting; J. H. Johnson, Trafford foundry, Westinghouse Electric & Mfg. Co., vice president; and C. H. Paul, Mackintosh-Hemphill Co., secretary-treasurer.

Following the dinner, Mr. Nadolny introduced the principal speaker, Howard Ramsey who presented a paper prepared by L. P. Robinson, director of core oil sales, Werner G. Smith Co., Cleveland. Mr. Ramsey is the company's sales representative in the Pittsburgh district. The speaker discussed sources of core oil trouble and outlined nine variables which enter into core room operation: Proper selection of core sands, proper selection of binders, use of cereal binders, proper ratios, proper mixing, moisture control, baking, venting and proper inspection.

Following the formal presentation of the paper Mr. Ramsey led an interesting discussion on various aspects of these subjects. A movie entitled "Mining and Loading Foundry Sands" was presented by the New Jersey Silica Sand Co., Millvale, N. J.

This meeting was the first of two designed as a course in foundry practice. The next meeting, to be held in October, will take up various molding problems. By open vote the executive committee was instructed to extend an invitation to the American Foundrymen's association to hold the 1939 convention in Pittsburgh.

## Buffalo

BUFFALO Chapter of the A. F. A. held its regular monthly meeting at King Arthur's restaurant, Buffalo, on Sept. 12. Approximately 60 members attended the meeting. W. J. Corbett, Atlas Steel Casting Co., Buffalo, and vice chairman of the chapter, presided in the absence of M. W. Pohlman, chapter chairman. The meeting was opened with a moment of silence in memory of A. Lockwood, Lumen Bearing Co., Buffalo, and former director of the Buffalo chapter, who died in July. The appointment of John McCallum, McCallum Hatch Bronze Co. Inc. Buffalo, as director of the chapter was announced at that time.

Glenn H. McClellan, commissioner of police, Buffalo, spoke after the dinner on the subject of crime prevention. He lauded the high type of men now coming into police work, and stated that many held college degrees. Commissioner McClellan said that the duties of a police officer not only included the detection and arrest of those who break the law, but also the protection of life and property. He explained the measures that his department had taken to decrease the number of crimes and fatal accidents in the city of Buffalo.

N. J. Dunbeck, Eastern Clay Products Co., Eifort, O., spoke on "Synthetic Sands." He drew a comparison between natural and synthetic sands, and gave reasons why each has a certain place in various types of work. He listed the various advantages and disadvantages of both, told how best to use the various clay bonds, discussed mixes, moisture contents, cleaning costs, and storage. Mr. Dunbeck's talk was followed by interested discussion and questions from the floor.—*J. R. Wark, Secretary.*

## Gives References

Herbert R. Isenburger, St. John X-Ray Service, Inc., Long Island City, N. Y., recently has completed a bibliography on industrial radiography. The bibliography comprises 776 references on 52 pages, and is available on photographic film for reading machines or on black and white prints. It may be obtained from American Documentation Institute, 2101 Constitution avenue, Washington, ordering document 1139.

## Safety Conferences

A series of one day conferences for safety engineers of various Pennsylvania industries will begin Oct. 19 at Pennsylvania State college, State College, Pa. This program will be held under the joint sponsorship of Pennsylvania State college, with Dr. Frank C. Whitmore, dean of school of chemistry and physics as sponsor and the state department of labor and industry, with Ralph M. Bashore, secretary, as sponsor.

M. A. Gimbel, safety engineer, General Electric Co., Schenectady, N. Y., is scheduled to give an illustrated talk on how that company has dealt with the silicosis problem in its foundry. He will be followed by other experts who will talk on safety and the prevention of occupational diseases.

## Opens Office

Connecticut Blower Co., Hartford, Conn., has opened an office at 155 East 44th street, New York, with J. G. Stalb as district manager. Mr. Stalb will cover New York city, southern New York state, Long Island, New Jersey and Delaware. The Connecticut company also has appointed the following five sales engineers: Carl E. Swift, Holland, Mich. for Michigan; John P. Gilboy, Scranton, Pa., for Pennsylvania; Martin E. Marsalis, Fort Worth, Tex., for Texas; Charles E. Kreipke, Evansville, Ind., for Indiana; and Chester J. Scanlan, Bloomington, Ill., for Illinois. Charles H. Keeney is general manager.

Sales and service of the Metallizing Co. of America Inc., Los Angeles, Calif., now are being handled direct by factory branches. New York and Chicago offices have been consolidated into a central office at 562 West Washington boulevard, Chicago. E. T. Parkinson will be in charge of the instruction department at that office. L. E. Kunkler, president and V. A. Cook, vice president also will be located in Chicago and will supervise eastern activities.

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# VIEWING Foundry Developments AT SHORT RANGE

IN THE production of aluminum alloy cylinder heads a patented procedure is to use a metal strainer comprised of a strip of steel punched full of small holes, to keep out dirt and inclusions. The cylinder heads are cast in a vertical position with a long flat gate. The strainer is located between that and the downgate which has several branches, and according to the patent the strainer is withdrawn just before solidification of the metal in the gate so that it can be used again.

* * *

A good composition for elevator sheaves contains 1.75 per cent silicon, 0.60 per cent manganese, 0.50 per cent titanium, 0.10 per cent vanadium, and 3.25 per cent carbon.

* * *

*White cast iron may be rolled into sheets retaining the white structure, and then heat treated to obtain temper carbon, or it may be rolled into sheets in which the formation of temper carbon is almost completed. In the latter case only an extremely short heat treatment is required to obtain the desired final structure.*

* * *

A combination deodorizer and cleaner has been developed for industrial use, and it is claimed especially suited for cleaning plant cafeterias, lavatories, and other work where destroying disagreeable and unpleasant odors is desirable.

* * *

To prevent or decrease warping resulting from the enamel firing process it is important that the sulphur content be not lower than 0.065 per cent, and not higher than will be neutralized satisfactorily by the manganese content. Sulphur content may reach 0.150 per cent without having an extremely detrimental effect on enameling properties.

* * *

Coating mold faces with blacking is difficult at times especially when deep pockets are present. Sprayed solutions tend to give nonuniform thickness, and run down into the pockets. To avoid such troubles one foundry has developed a coating device whereby the mold is laid face down on a platform, the blacking solution pumped up against the face, and then allowed to drain away.

* * *

THIN-WALLED gray iron articles are being produced in Russia by a combination of casting and pressing. The iron is melted in a high frequency induction furnace and poured directly into a die under the furnace. A top die immediately is lowered into the bottom die by a lever, and is raised almost at once, and the casting thrown out of the mold. If the castings are removed too quickly from the press, drops of liquid metal sweat through the solidified surface.

* * *

Corrosion resistant steel castings which are to be welded by the oxyacetylene process should be preheated to a red heat to avoid cracking, and cooled slowly after welding. Rod similar to the base metal or 18-8, should be used. An excess acetylene flame is said to aid welding and is permissible.

* * *

According to some tests conducted in England, vibration removes stresses in gray iron castings, and improves the strength. The castings on which the tests were conducted were cast iron railway chairs cast onto steel sleepers. As cast the transverse strength of the castings ranged from 44,800 to 56,000 pounds while after 12 months service on the track, the strength increased to 89,600 to 112,000 pounds.

* * *

WHILE in any foundry the linings of both mixing and hand ladles should be dried carefully to avoid boiling, that operation is particularly important where the iron later is to be enameled. Iron which boils in the ladle often blisters on enameling. To insure against that, all ladles with unused linings should be washed well with molten iron which is pigged and used in later heats.

* * *

A new device for ascertaining the carbon monoxide content of any given air space has been perfected and will be made available to the public shortly. Said to be almost negligible in cost and so simple that it can be constructed by anyone with a slight mechanical knowledge from materials obtained from a hardware store and a drugstore, the device should be welcomed by those interested in making tests for carbon monoxide.

* * *

Hard-facing the edges of sand mixer plows in one foundry is said to have resulted in considerably increased service. In a 14-day run about ¼-inch wears off the hard-faced plow while those not treated wear the same amount in 2 day's operation. Differential hard-facing of the plow also makes it wear evenly.

# Machines, Jobs, and Advertising*

MACHINES have been in the limelight pretty much recently and there has been a good deal of misleading talk about them. One fallacious notion about machines is that they cut down the amount of employment—that greater use of machines in industry means a smaller number of jobs.

It is important that we know the truth about this, for without question machines have deeply affected all industry and its individual wage earners. The facts show that besides making life easier for workingmen, machines also create new opportunities for employment and actually increase the total number of jobs. In this process, advertising is a very important factor.

About the time of the American Civil War our industries began to change from neighborhood shops with hand labor to the modern factory system, equipped with machines run by power. From the very beginning of this movement there were always some people raising the cry that machines put men out of work. But that has not happened, for the simple reason that machine-made goods were sold at lower prices, more people bought them, and more men were employed to make them.

Not long ago all window glass was manufactured through the lung power of human glass blowers. Now it is all made by the use of huge glass-making machines. The cost is much less and so much glass is used that many more men are employed in the industry than formerly. At the last census, 98,000 persons were employed in glass factories.

Shortly after the Civil War the amount of mechanical power used to operate machines in American industries was only 1-1/10 horse power for every wage earner. Sixty years later there was 4-9/10 horse power per wage earner. As a result the amount of work turned out by each man rose so rapidly during this period that the value added by manufacture increased from $658 per wage earner to $3,600. In other words, the mechanical power used in industry increased more than four-fold per worker and the output per worker increased more than five-fold.

And in the meantime, what happened to employment? In the same period the population of our country increased 3-1/10 times and the number of persons gainfully occupied increased 3-9/10 times. As industry substituted machines and power for hand labor, the productivity of each worker increased and the number of jobs increased faster than the population. During this same period the annual earnings per worker were multiplied by nearly 4½.

When we think of this tremendous progress it is well to remember that the greatly enlarged output of industry does not automatically find a market. One of the most important factors in distributing the ever-increasing volume of goods is the use of advertising, without which this mass distribution would be impossible. In a way, advertising is really a key to our industrial progress. Many industries owe their growth directly to the power of advertising.

The machine age means more things for more people and advertising is its indispensable tool.

*PREPARED BY THE BUREAU OF RESEARCH AND EDUCATION, ADVERTISING FEDERATION OF AMERICA

*Advertisement*

# CHICAGO . . . Makes Large Castings

By W. G. GUDE

Fig. 1—Housing casting 22 feet long, 10 feet wide and 12 feet deep weighs 40 tons

ALTHOUGH unusually large and requiring considerable core work, the recent casting of a 40-ton housing for a milling machine presented no serious problems to the producer, the Tarrant Foundry Co., Chicago.

This housing, Fig. 1, measuring 22 feet long, 10 feet wide and 12 feet deep, said to be the largest semisteel casting ever made in the Chicago area, is the upright section of a huge milling machine being built by Ingersoll Milling Machine Co., Rockford, Ill. The bed for this machine, Fig. 2, also cast by the Tarrant company, is 38 feet long, 27 inches deep and weighs nearly 20 tons.

The housing was cast on its side in a pit mold as shown in Fig. 3. To eliminate possibility of underground water seepage into the mold, a concrete pit was built. This pit is 14 feet deep, 30 feet long and 16 feet wide.

For conveying metal into the mold, two down sprues and six draw gates at various levels were located at the deep end and two down sprues and four draw gates were placed at the opposite end. On each side of the center of the mold two down sprues and two draw gates were employed. Large dry sand cores were required because of the hollow nature of the casting. Cores located in the deep section were bonded with a pitch compound. An oil binder was used for cores in the shallow section.

Fig. 3—Housing casting was molded on its side in a reinforced concrete waterproof pit in the floor of the foundry

Between 200 and 250 tons of weights were placed on top of the completed mold. Actual pouring time was less than 30 minutes, with more than an hour required for subsequent feeding. Metal was obtained from two cupolas, one 48 and the other 54 inches in diameter. More than 45 tons of metal was melted. The casting was permitted to cool in the mold for about a week, making a total of 65 days of actual time spent in its production.

Tarrant Foundry Co., one of the pioneers in heavy castings work in the Chicago district, was established in 1880. The plant has a capacity of 1000 tons a month. John Johnson Jr. and Stanley F. Prybylski are co-managers.

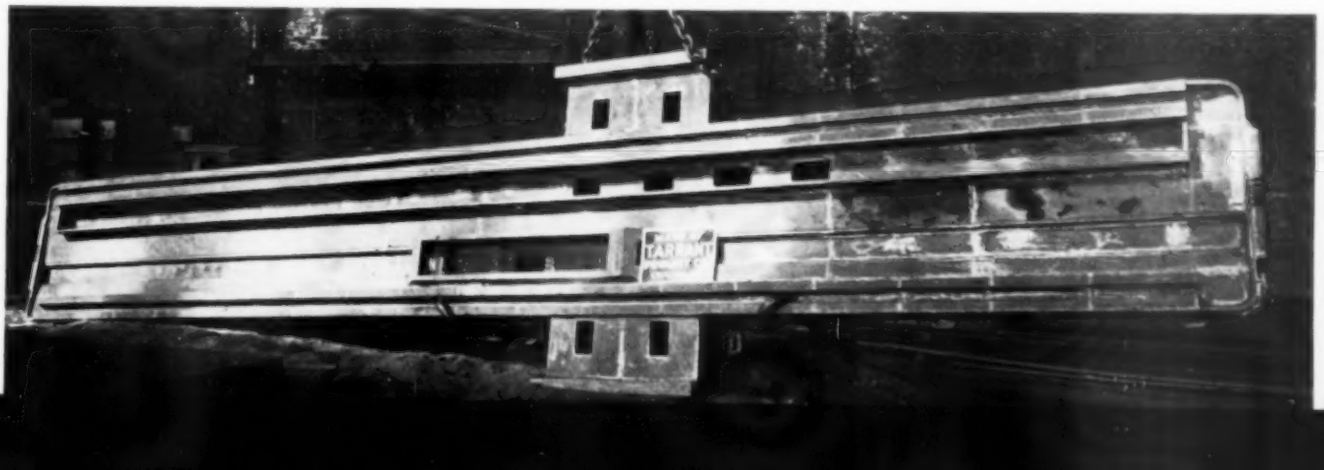

Fig. 2—Bed casting 38 feet in length weighs 20 tons

# Discuss Wide Range of Topics At Michigan Conference

HIGHLY technical problems pertaining to the casting of metals, featured the second fall technical conference of the American Foundrymen's association held Sept. 15, 16 and 17 at the University of Michigan, Ann Arbor, Mich., in co-operation with the university and the Detroit chapter of the A. F. A. Dr. Richard Schneidewind, University of Michigan was chairman of the conference committee arranging the program and local features.

The first session, devoted to malleable iron, was held Thursday morning with Enrique Touceda, Malleable Founders' society, Albany, N. Y., as chairman. James H. Lansing, Malleable Founders' society, Cleveland, led the discussion on annealing of malleable iron. Mr. Lansing first described the metallurgical changes which take place in the annealing process, and then outlined the three general types of ovens in use, namely: periodic, continuous, and special.

Under periodic, the speaker listed the following and explained the advantages and disadvantages of each: 1. Conventional batch type, direct fired with a period of 4 to 8 days; 2. Small batch type insulated with fire brick with a cycle of from 4 to 5 days; 3. Car type batch oven, oil, gas, or coke fired with a period of 4 to 5 days; 4. Muffle type oven fired by oil or gas with a period of 7 to 10 days; 5. Car type batch oven heated electrically with a period of from 2 to 3 days.

Continuous ovens include the following: Dressler type with a period of from 2½ to 6 days; continuous conveyor type using radiant tubes or gas with a period of from 1½ to 2 days. Special ovens for high silicon may adapt any oven to a reduced cycle or use a continuous conveyor with radiant tubes requiring 14 to 16 hours.

Dr. Schneidewind stated it has been found that increasing the soaking temperature decreases the tensile strength and the desirability of the malleable iron. He stated that for every 100 degrees increase in soaking temperature, a 5 per cent decrease in tensile strength resulted. Dr. Schneidewind stressed the importance of the paper presented at the Cleveland convention of the American Foundrymen's association by A. L. Boegehold, General Motors research laboratory, Detroit. Mr. Lansing stated that tests have shown the impact property of the metal is improved where the second stage of graphitization was held for a considerable period of time.

### Tests on Grain Size Control

Dr. C. H. Lorig, Battelle Memorial institute, Columbus, raised the point as to what has been done regarding grain size control. Dr. Schneidewind reported that some tests have been made with alloys, such as titanium and zirconium. A metal containing these alloys, when annealed at 1740 degrees Fahr. had a fine grain size. However, it was stated that if the material is held too long below the critical, the grain size will start to grow. R. G. McElwee, Vanadium Corp. of America, Detroit, stated that a combination of titanium and zirconium seems to provide a mixture having a high silicon pressure and results in an increased malleablizing rate.

In reply to a question concerning the life of radiant tubes, Carl Joseph, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich., stated that his organization has operated one radiant tube oven for 2 years, and that the tube cost per ton of metal going through the annealing oven has been low. In closing Mr. Lansing stated that the malleable industry, is striving toward a better product, the application of continuous operation where the production warrants, and the improvement in the annealing cycle.

Second paper of the session was presented by John A. Dow, Holcroft & Co., Detroit, and was concerned with controlled atmospheres for annealing or heat treating. In that work it was necessary to supply atmospheres which would not add carbon to the material, and also were nonscaling. Hence, a close balance had to be maintained in the components of the atmosphere admitted to the furnace. Controlled atmospheres may be generated by burning charcoal or natural gas under controlled conditions whereby insufficient oxygen is admitted for complete combustion, and hence, no oxygen is in the final gas.

Mr. Dow pointed out that carbon dioxide and water vapor have a decarburizing effect while carbon monoxide and hydrogen have no effect.

(*Concluded on page* 68)

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## SPEED SIFTER

***A New Type Sand Riddle with Greater Capacity, Longer Life and Completely Sealed-In Mechanism***

The ROTOPLANE Speed Sifter is correctly designed to do **all** your foundry sand sifting more quickly and economically. Rigid frame and smooth rotary motion impart a vibration very effective for high production work. The activating weights swing free and cannot pound ball bearings, thus greatly increasing bearing life.

All mechanism is completely enclosed; no bearings or activating parts exposed to dust and grit. No oil dripping, no relubrication. Machine is easily handled and carried by one man. Overall height 62 inches; weight approximately 90 lbs., with strong one-piece frame of tough, aluminum alloy.

Both the All-Steel Bottom and Quick-Change Sieves (two remarkable riddle features developed by us) are incorporated in the new ROTOPLANE Sifter. **Order one TODAY . . . 10 Days' Free Trial.**

**Price $175.00 f. o. b. Chicago**

Complete with cable, plug, grounded safety wire, and one new type sieve (mesh Nos. 2 to 4). Standard ⅓ h.p. motor, 115 or 230 volt 60 cycle single phase. Other motors quoted on request.

***You'll Like These New***
### QUICK-CHANGE SIEVES

These remarkable new sieves are mounted in strong steel ferrule and are instantly interchangeable by means of quick-locking device on the split-ring bottom. Al sieves have 20-in. diameter clear sifting area. No jagged edges to tear workers' hands; no storage problem, no waste space. You can "stack them just like playing cards."

**Extra Quick-Change Sieves Sizes 2 to 4 mesh, $1.35 each**

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CABLE ADDRESS: ROTOPLANE, CHICAGO.

***SOLD BY LEADING FOUNDRY SUPPLY COMPANIES THROUGHOUT THE COUNTRY***

(*Continued from page* 66)

Hence in malleable annealing it is advisable to have an atmosphere lower in carbon dioxide in the first stage annealing than in the second stage. He stated that rate of gas flow over the surface of the material being heat treated has a decided effect, and the slower the gases pass over the surface, the lower the rate of decarburization. Therefore, the furnace employed should be as gas tight as possible, and the generated gas atmosphere employed should enter the furnace at several points to provide an excess interior pressure.

A. B. Kinzel, Union Carbide & Carbon Research Laboratories Inc., New York, in discussing the paper said that balancing the various gases in controlled atmospheres brought up many problems, and that recently one of the large steel firms installed equipment to bright anneal steel sheets which provided an atmosphere containing only nitrogen and hydrogen. Cost of such equipment naturally was high running approximately $100,000 for apparatus to supply 15,000 cubic feet per hour.

### Described Age Hardening

The nonferrous session held Thursday afternoon was under the direction of E. R. Darby, Federal-Mogul Corp., Detroit, and was opened with a brief address by Prof. A. E. White, director of the department of engineering research, University of Michigan, in which he welcomed those attending the conference to the university. Mr. Darby then called upon L. W. Kempf, Aluminum Co. of America, Cleveland, who spoke on the age hardening process as applied to castings.

Mr. Kempf described the fundamentals of the process in terms of structural and property changes using the binary alloys to simplify the discussion, and then described modifications required for application to commercial materials. He discussed some of the casting alloys in commercial use and enumerated factors of most importance in commercial application of the age hardening process.

In the discussion which followed a question was asked on the effect of strain on precipitation hardening, and the reply was that it increased the effect, especially such an operation as cold working on wrought materials. Dr. C. H. Lorig, pointed out that in ferrous materials for example copper-steel, the best physical properties were developed on heat treatment, and consequently, precipitation treatment for hardness was easier to obtain. He also stated that a small amount of tin on the order of 0.2 per cent will inhibit precipitation hardness of copper-steel.

In reply to an inquiry on corrosion resistance by H. M. St. John, Crane Co., Chicago, it was stated that corrosion resistance will vary with the alloy and the type of age hardening treatment. Hence, all factors must be considered, and selection made on whether a straight precipitation or solution-precipitation method will give the desired results. E. R. Darby asked whether a visible precipitate under the microscope was an indication that age hardening had been accomplished. The reply was that in general, the best properties were obtained before visible precipitation had occured.

The second paper presented at the nonferrous session was by A. B. Kinzel and related to high conductivity copper castings with relatively high strength. While chromium can be added to copper to provide good conductivity with a reasonable strength, much better results are obtained with addition of a third element such as silicon or beryllium. One composition contains 0.08 per cent silicon and 0.80 per cent chromium. The alloy is heat treated to obtain the best properties, which consists in heating to 2 hours at 1742 degrees Fahr., quenching in water, reheating for 1 hour or more at 932 degrees Fahr., and cooling in the furnace. That results in a conductivity of 85 per cent, ultimate strength of 52,000 pounds per square inch, and an elongation of 18 per cent in 2 inches.

### Gives Alloy Uses

Mr. Kinzel also described other alloys containing nickel and cobalt and silicon, and chromium-copper with additions of silver, cadmium and tin. He then discussed melting procedure for the copper-chromium-silicon or beryllium alloys, and gave information on molding practice. He concluded his paper with the fields of use for high conductivity-high strength copper castings.

In the discussion O. V. Miller, P. R. Mallory & Co., Indianapolis, pointed out that in the production of the various alloys mentioned, a close co-operation was required between the foundryman and the producer of the alloy to obtain the best results. He said that too much silicon in the alloys caused trouble, and that the constant properties of the alloys permitted pouring into a wide range of section thicknesses without difficulties. He also said there was a possibility of embrittlement in the alloys.

Mr. Kinzel agreed that control is necessary and desirable, and that the ratio of silicon to chromium should be correct. Intergranular embrittlement is possible through oxidation during melting, but with ordinary care there is little reason for its occurrence. E. R. Darby said that the copper-chromium-silicon alloy should be melted and poured as quickly as possible to prevent oxidation. Also he stated that the addition of 0.08 or 0.09 per cent phosphorus aided fluidity and counteracted the effect of iron. However, since excess phosphorus decreases conductivity, it should be added with care.

Following the dinner on Thursday evening, a motion picture was shown of the University of Michigan football team in action. W. J. Cameron, Ford Motor Co., was the principal speaker at the annual dinner Friday evening. Mr. Cameron predicted that the United States is only in the stage coach era of development and that virtually all social advances of the future will issue from the application of science to industry.

### Graphite Is Factor

V. A. Crosby, Climax Molybdenum Co., Detroit, presided at the Friday morning session on cast iron theory. A paper "Transformation Rates of Austenite in Cast Iron" by Prof. W. P. Wood, Dr. D. W. Murphy and C. D. D'Amico of the University of Michigan, was presented by Dr. Murphy. The speaker outlined the work that has been done on the subject and concluded that the austenitic matrix of cast iron on cooling from a temperature above the critical will show the same type of behavior as illustrated by the S-curve for steel. Results also indicate it seems probable that the cooling rate in a given casting and the position of the S-curve for the given iron will determine, to a considerable degree, the matrix structure and the physical properties, such as hardness and strength in the as-cast condition. The authors point out that it is recognized the type and distribution of graphite also is a factor of great importance in determining the property of an iron. The final conclusion was that increasing the grain size and probably the presence of alloys such as nickel, chromium, molybdenum and manganese will cause the S-curve for a given type of iron to be displaced to the right.

The second paper "Effect of Under-Cooling on the Nature of the Graphite Pattern in Gray Cast Irons" by Dr. R. Schneidewind and C. D. D'Amico of the University of Michigan was presented by Dr. Schneidewind. The authors point out that an investigation indicates the rate of cooling of the metal is responsible for a difference in graphite particles. Considerable under-cooling, or the phenomena of the metal remaining liquid below the thermal freezing point, occurs in gray iron. A wedge having inserted thermocouples was produced to determine the influence of rate of cooling.

The results of the test indicate that cast iron of the composition tested is susceptible to under-cooling. For that composition, under-cooling may be as great as 100 degrees Fahr. below the thermal equilibrium freezing point and still

(*Concluded on page* 71)

(*Concluded from page 68*)

gray iron is produced. A solidification temperature between 2060 degrees Fahr. and 1970 degrees Fahr. produces graphite patterns which are characteristic of the actual freezing temperature. The lower the temperature, the finer will be the graphite and the greater the tendency for the eutectification pattern. Still greater degree of under-cooling will inhibit the precipitation of graphite to form mottled and white irons.

Victor Zang, Unitcast Corp., Toledo, O., presided over the cast steel session which was held Friday afternoon. The first paper was presented by James Corfield, Michigan Steel Castings Co., Detroit, and related to highly alloyed steel castings for heat and scale resistance. According to Mr. Corfield those alloy steels may be divided into three general types comprising iron-chromium, chromium-nickel, and high nickel-chromium groups. The first type has many applications mainly in resisting oxidizing acids and gases and some types of sulphur rich gases at high temperatures. Chromium-nickel steels resist hydrogen sulphide, and great stress at high temperature. They also resist sudden changes in stress or temperature. High nickel-chromium alloys serve well under reducing conditions.

### Find Spectrograph Useful

The second paper by A. M. Sampson, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., discussed the spectrograph as a foundry tool, and dealt with the installation in his firm's plant. At present accurate determinations of various elements except phosphorus, carbon and sulphur can be obtained spectrographically in a short time. The phosphorus, carbon and sulphur are determined by the usual chemical procedure. While a quantitative determination of silicon, chromium, manganese, molybdenum, nickel and copper on a single sample can be obtained in 10 minutes, the usual procedure is to run several samples consecutively which results in the determination of 20 elements in 20 minutes. Accuracy of results are within 1 to 3 per cent of the amount of the element present. Range of the quantity of an element present is from 0.10 to 3.0 per cent.

Final paper of the session was presented by R. H. McCarroll, Ford Motor Co., Detroit, and was entitled, "Cast Steels in Automotive Work." He pointed out that at the present time about 149 pounds of finished cast steel parts are used in the Ford car, and those include valves, crankshafts, valve seats, wheel hubs and pistons. He also mentioned that two alloy cast iron parts, push-rods and camshafts, had replaced steel forgings.

Mr. McCarroll gave average compositions and physical properties of the various castings, and stated that cast steel parts while supplying numerous manufacturing advantages, have given in general, better results in service than the forged part replaced, and weigh less although in some cases the weight is the same. He illustrated his talk with enlarged photographs of a casting for a rear truck axle which replaced three separate pieces, a rear axle end and spring perch which replaced two forgings, and a truck drive shaft universal end which replaced a forging, with a considerable weight saving.

### Pour Castings Centrifugally

He then described centrifugal production of steel castings, pointing out that this method gave a better structure, an extremely high yield of castings, and permitted use of a less fluid metal with consequent lower pouring temperature, and less damage to the mold. Castings made by that process include cluster gear blanks, passenger and truck ring gears, and other gears for experimental purposes. Pouring temperature is 2900 degrees Fahr., and the molds rotate at 400 revolutions per minute. The molds are poured every 4 minutes, and are made from a low carbon alloy steel containing 0.20 per cent carbon, 1.5 per cent chromium, and 1.5 per cent molybdenum. Molds are cast to size without machining. The paper is presented on page 30 of this issue.

Closing session of the conference was held Saturday morning under the chairmanship of Fred J. Walls, International Nickel Co., Detroit. Dr. C. H. Lorig, presented the first paper on "Some Factors Affecting Properties of Superheated Cast Iron" in which he stated that while temperature has an important effect on properties of cast iron, it unfortunately is unpredictable. Other factors include composition, atmosphere, ladle additions, time of holding metal in the furnace, pouring temperature, cooling rate, etc.

Dr. Lorig said that high temperature melting tends toward formation of dendritic graphite, but since cupola melting temperatures are not so high that trouble is not usually encountered. Low carbon irons according to him, are more susceptible to formation of dendritic graphite. He pointed out that ladle additions of silicon up to a certain point which he indicated as 0.8 to 1.0 per cent, gave the best results. Pouring temperatures from 2550 to 2850 degrees gave the best results.

In discussion of the paper L. H. Rudesill, Griffin Wheel Co., Chicago, said that he had found that effect of 97 per cent silicon as a ladle addition was the same as 50 per cent ferrosilicon, and that best results were obtained with 0.9 per cent silicon. He stated that the ferrosilicon should be free from aluminum to prevent inclusions and gas pockets under the surface. With irons of malleable composition silicon additions do not have any effect. Size of the ferrosilicon added is important. It should not be too coarse or too fine.

S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago, pointed out that effect of ladle additions will depend upon the alloy, its specific gravity, particle size, solubility, and the amount added. In the case of silicon, he said he was inclined to attribute some of the difficulties, and lack of definite effect in some cases to oxidation of some of the silicon. Unfortunately, it is practically impossible to determine the condition of silicon in the iron. V. A. Crosby agreed that best results were obtained with about 1 per cent silicon addition in the ladle.

### Vanadium Functions as Deoxidizer

Final paper of the conference was that by R. G. McElwee, on "Influence of Composition on the Properties of Electric Furnace Irons." In opening his discussion he mentioned that the average foundryman had little to fear from dendritic graphite formations and primary ferrite since that peculiarity only occured in irons which had a composition intermediate between white cast iron and pearlitic irons. He pointed out that there are a variety of ways to control the product in the foundry, but that in many instances, it is difficult to be sure that the final results are exactly as desired.

However, Mr. McElwee showed by numerous illustrations from an extended investigation that additions of small amounts of vanadium up to 0.3 per cent tended to stabilize the structure, and hence, made it possible to predict the results. Since vanadium also functions as a deoxidizer as well as a carbide stabilizer, it is necessary that the iron be deoxidized before addition of vanadium to obtain the most benefit. In the discussion a question was asked on the effect of manganese on the structure. It was replied that in the ordinary range from 0.55 to 0.80 per cent, no appreciable effect was noticeable. V. A. Crosby said that in his opinion it was easier to obtain normal graphite with high manganese say 1.0 to 1.25 per cent, and low silicon with deoxidation. However, the silicon must be held low to obtain the proper effect of high manganese.

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R. G. Haskins Co., manufacturer of flexible shaft equipment and high speed tapping machines, has moved to its new building at 615 South California avenue, Chicago. The move to large quarters was necessitated by the need for additional manufacturing facilities.

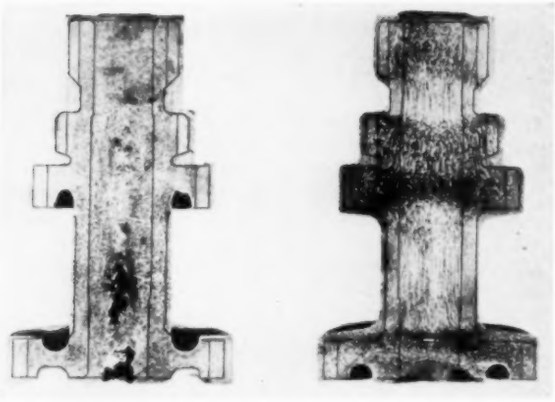


Fig. 5—Etched macrosections of cast steel and forged steel gear blanks. In the cast part at the left the best structure is located where needed. The poor structure in center is removed by drilling hole for the shaft. Forged part at right indicates weakness parallel and near base of teeth where greatest strength is needed

# Automotive Steel Castings

(*Continued from page* 31)

drop it on the floor will break into many pieces.

It is our opinion that the foundry industry and all others in a position to know should help in this matter of definition as a means of education regarding the difference in physical properties and the suitability of some of these newer materials for parts which could not previously be cast satisfactorily. The term *satisfactorily* really is far too weak here. While numerous manufacturing advantages resulting from a change of steel castinges are cited, we would like to emphasize that the cast steel parts almost always have given better results in actual service than the forged parts they replaced, and always at least as good. Another requirement is that the cast part must never weigh more. In almost all cases the weight has been less. Here, only the simple physical properties of some of the cast materials such as shown on the analysis chart will be considered. We have attempted to select average results and compare them with ordinary malleable, our so-called quick malleable and rolled steel as shown in the accompany table. We are deferring until later any consideration of fatigue tests, notch effect or the effect of grain flow as the result of forming.

Now to go on with the work in progress:—

Parts which are on small scale production we will consider under two divisions. First, those which are being sand cast in stationary molds, and second, those which are being centrifugally cast in permanent molds. Illustrating some of these newer sand cast parts, let us call your attention to Fig. 4.

At the top of the illustration will be seen a casting for the truck rear axle housing. Two of these are used in each truck, being riveted to each side of the center malleable bell housing castings to make the complete axle housing assembly. Directly under this casting is shown the previous tubular section, swedged down on the end and the two forgings which were welded on, in locations shown, to make an assembly. In this case we have one casting taking place of three separate pieces.

We would like to call your attention to the comparative wall thickness of different sections of these parts as made by the two different methods. Being able to vary your wall thickness as desired and put the metal just where you want is a great advantage in favor of castings. This casting is made from copper-silicon No. 7, and annealed and air cooled to a brinell hardness of 170-228.

### Castings Replaces Forgings

The casting shown at the lower left in Fig. 4 is that of a rear axle end and spring perch for a passenger car. Beside it are shown the two forgings which were formerly welded together, at the place shown, to make an assembly. Here, one casting replaces two forgings. The castings for this part are made from copper-silicon No. 4, and are heat-treated to a brinell hardness of 163-207. Two castings are used per car and they are butt welded to the outer ends of the rear axle housing tube.

The third part shown at the lower right of Fig. 4 is the truck drive shaft universal end. Here, one casting replaces only one forging, but we have a considerable weight advantage in that the rough casting weighs only 8½ pounds, while the rough forging weighs 10 pounds 6 ounces. The weight of the finished machined part is 6 pounds 1 ounce. One of these parts is used in each truck and is butt welded to the front end of the drive shaft tube. The material specified is copper-silicon No. 4. The castings are normalized before machining in the same manner as the forging.

The reason that malleable castings cannot be used for these three parts, even if the sections were made large enough to have sufficient strength, is, of course, because of the welding of these parts into the assembly. There are many other parts under this classification which are being cast experimentally, either by ourselves or our suppliers, but we do not believe it worth while now, to bring them into this discussion.

We now come to the consideration of the work we are doing on the centrifugal casting of automotive steel parts. Some information has already been published on this, as indicated in the bibliography. There has been a great deal of interest shown in this work.

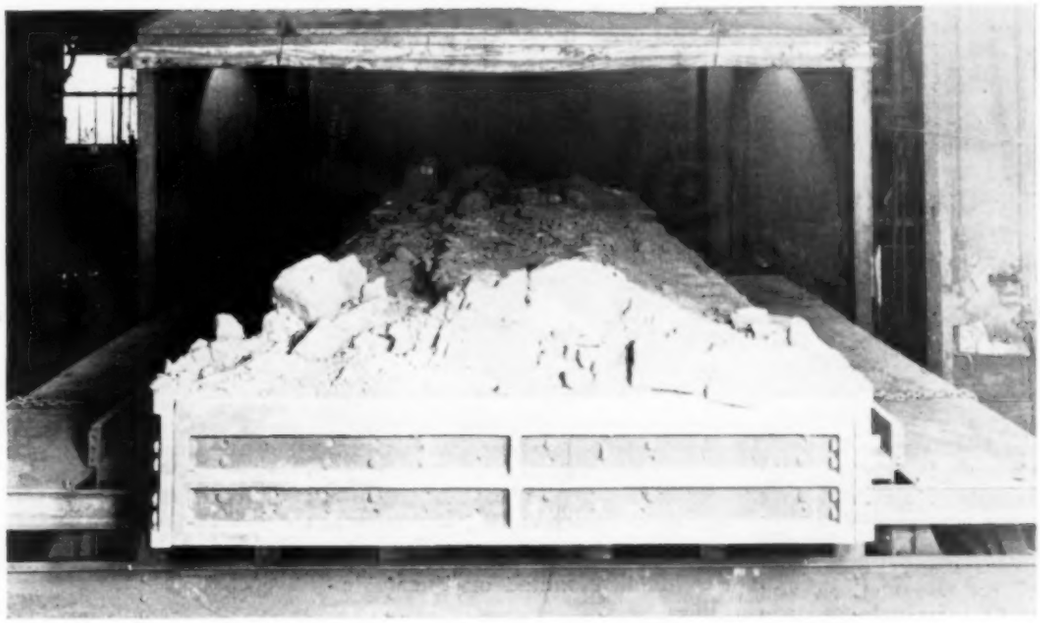
Centrifugal casting is, of course, not new. We are all familiar with the centrifugal casting of iron pipe

(*Continued on page* 74)

Fig. 4—Top shows cast steel truck rear axle housing. Just below is fabricated part replaced. Lower left shows rear axle end and spring perch replacing two forgings beside it. Lower right shows cast shaft universal end weighing considerably less than forging replaced

# Man Size SHAKE-OUTS

## *doing Giant's Work!*



Four Model "D" Shake-Outs Mounted On a Car

**Simplicity Shake-Outs are designed and constructed to handle giant-sized flasks without expensive maintenance. Large flasks are shaken out in fast time, whether green sand, baked dry sand or concrete molds. The rapidly increasing number of Simplicity installations for handling large work testifies eloquently to their striking success.**

Shown above is a large car on which is mounted four model "D" 4' x 6' Simplicity Shake-Outs. Loaded with a variety of large flasks, the car is pulled into the shakeout room and the dust exhausted during the shake-out operation. Cut shows baked dry sand mold weighing 80,000 pounds. Shake-out is accomplished in from *two to four minutes!*

The Simplicity Engineering Company pioneered the development of high speed vibrating type shake-outs for heavy work. Many so-called "impossible" jobs have been successfully handled and over five hundred Simplicity Foundry Units are in daily service.

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## CAST STEEL ANALYSIS CHART

8-31-38

| TYPE | PARTS | Carbon | Copper | Silicon | Manganese | Molybdenum | Chromium | Phosphorus | Sulphur | | Heat Treatment and Hardness |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Clutch Pedals and Steering Wheel Hub | 15-35 | 150-200 | 60-80 | 40-60 | | | 08 Max | 08 Max | | Normalize to Brinell Hardness of 163-207 |
| 2 | Truck Ring Gears and Parts to be Carburized | 28-35 | 50-150 | 40 Max | 30-45 | | 90-120 | 05 Max | 05 Max | | Normalize – Carburize and Direct Quench or Reheat and Oil Quench and Draw to Rockwell C 58-62 |
| 3 | Centrifugal Casting Trans Countershaft and Differential Ring Gears | 35-40 | 50-150 | 40 Max | 65-80 | | 90-110 | 05 Max | 05 Max | | Normalize to Brinell Hardness 170-196 Harden Gears as per Part Prints |
| 4 | Rear Axle Shaft Housing Flange Truck Universal Joint Housing Connecting Rods | 35-45 | 50-150 | 40 Max | 70-90 | | | 10 Max | 08 Max | | Normalize to Brinell Hardness 163-207 Univ Joint Hous. to remain as normalized Rear Axle Shaft Housing Flange – Harden as per Part Print Connecting Rods – Oil Quenched and drawn to Brinell 255-286 |
| 7 | Truck Rear Axle Housing Tube | 135 155 | | 90-110 | 40-60 | | 08 Max | 10 Max | 08 Max | | Normalize to Brinell Hardness 170-228 |
| 8 | Crankshaft Bearing Sleeves and Parts to be Hardened | 135 160 | 150-200 | 85-110 | 70-90 | | 40-50 | 10 Max | 08 Max | | 1650°F at heat 20 min. Air cool to a Max of 1200°F Reheat to 1400°F Hold for 1 hr Furnace cool to 1000°F Brinell 255-321 Parts to be Hardened may be Oil Quenched and drawn to Rockwell C 52-60 |
| 9 | Piston | 140 160 | 100-150 | 90-110 | 80-100 | | 08-15 | 10 Max | 08 Max | | 1650°F at heat 20 min Air cool to a Max of 1200°F Reheat to 1400°F Hold for 1 hr Furnace cool to 1000°F in hr Brinell Hardness 190-228 |
| | Valve Insert | 120 140 | 150-200 | 50-60 | 50-50 | | 25-35 | | | Tungsten 16 17.05 | 1450°F at heat 30 min. Cool in 3 hrs. to 1000°F. Rockwell C 36-46 |
| | Valves | 95 120 | | 20-35 | 20-50 | | 150-1602 | | | Ni 140 150 | Rough Grind. Reatrike. Anneal at 1550°F for 30 min. Cool Slowly Rockwell C 22 min |

88-3549

(*Continued from page* 72)

and the work done in centrifugally casting iron against steel backing plates. Even the centrifugal casting of steel is not new, railway car wheels have for many years been manufactured by this method, and much work has been done on the centrifugal casting of steel ingots and billets.

We do believe, however, that the centrifugal casting of relatively small parts, such as we are about to consider is new. Three of the main advantages of this method of fabrication are: 1—Better structure. 2—Extremely high yield of castings when compared to back-stock. 3—The ability to use a less fluid metal, which means lower pouring temperatures and less damage to the mold, and also the possibility of more easily casting lower carbon steel.

### Molds Mounted on Turntable

Fig. 3 gives a picture of the present state of development of our centrifugal casting machine. It consists essentially of a turntable 22 feet in diameter on which there are 18 stations for rotating heads. You will note there are as yet only 6 heads or pouring stations installed and that little mechanical handling equipment is complete. The turntable makes one revolution every 4 minutes. Each head is driven by an individual motor turning at 400 revolutions per minute. We estimate that this machine, when completed, should produce more than 8,000 gears, such as the transmission cluster gear, in 16 hours. The pouring temperature is about 2900 degrees Fahr.

Fig. 1, shows the steel mold and cores now being used on this machine to produce the double casting for the two gears shown at the right in this same figure. We believe that the position and purpose of the 6 cores shown will be easily understood by their relative locations in the illustration. Dead load tests of the finished gear made from the casting show it to be fully as good as the gears made from forgings. This is also true of impact tests on gear teeth.

Life tests under overload of the finished transmissions show the cast gear to have a considerable advantage. Part of the explanation for this is shown in Fig. 5.

This illustration shows a section of the cast gear at the left and the forged or upset gear at the right. Both sections have been etched to the same degree to show the structure of the metal. Lines have been laid out on each section to show the finished machined size.

In the case of the cast gear the best structure will be found where most strength is needed. The poor structure in the center is removed by drilling the hole for the shaft. In the case of the forged gear a weakness will be found parallel and near the base of the gear teeth where greatest strength is needed.

### Castings To Replace Forgings

Microphotographs are not being shown as both are very similar, even as to grain size, this being 5 to 7.

In Fig. 2 are shown first, at upper right, this same transmission gear with feeders in position, second, at lower right, the truck rear axle ring gear, third, the passenger car ring gear, and fourth, other gears produced on an experimental scale.

Because we have almost reached the time we have allotted, we cannot discuss at any length the effect such developments may have on the industries concerned. They certainly point to a definite trend toward the replacement of forgings by castings. However, this competition is spurring forging sources to greater efforts and we have had one case in the last year where a forging replaced a casting, to advantage. This competition thus furthering greater progress and benefiting both the user of the finished part and the ultimate consumer, this being in our case the automobile purchaser. It is hardly necessary to say that Mr. Ford has been, not only the inspiration for most of this progress, but the source of many of the ideas that made its success possible

(*Concluded on page* 77)

## PHYSICAL PROPERTIES OF TEST BARS

9-8-38

| TYPE | ELASTIC LIMIT | TENSILE STRENGTH | ELONGATION IN 2 INCHES | BRINELL HARDNESS |
|---|---|---|---|---|
| No. 1 | 53,800 lbs psi. | 71,100 lbs psi. | 18.5 % | 163 |
| No. 2 | 56,500 " " | 78,000 " " | 16.5 " | 170 |
| No. 3 | 62,000 " " | 86,000 " " | 16.0 " | 184 |
| No. 4 | 65,120 " " | 90,750 " " | 15.2 " | 187 |
| No. 4 Hardened | 108,150 " " | 128,620 " " | 10.0 " | 277 |
| No. 7 | 84,000 " " | 103,000 " " | 9.0 " | 207 |
| No. 8 | 95,080 " " | 120,250 " " | 6.5 " | 255 |
| No. 9 | 85,000 " " | 104,710 " " | 7.5 " | 229 |
| Regular Malleable | 38,000 " " | 52,000 " " | 15.7 " | 119 |
| Ford Malleable | 43,000 " " | 60,500 " " | 14.0 " | 140 |
| .30 Carbon Forged Steel | 60,000 " " | 85,000 " " | 27.0 " | 165 |
| .40 Carbon Forged Steel | 80,000 " " | 110,000 " " | 20.0 " | 225 |

ADVERTISING PAGES REMOVED

(*Concluded from page* 74)


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GENERAL

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## One Heater Serves Several Ovens

An interesting development in heat application to rolling drawer core ovens is shown in the accompanying illustration of an installation recently built by the Foundry Equipment Co., Cleveland, for the Carondelet Foundry Co., St. Louis.

A battery of four rolling drawer core ovens, each containing 5 drawers 42 inches wide x 72 inches long, is heated by a single gas-fired external heater. Through a system of heat supply ducts, heated air is delivered from the heater to the various oven compartments by a heat supply fan. A set of recirculating ducts leading to a common header, returns approximately 80 per cent of the heated air to the heater for recirculation. Another set of vent ducts leading to an exhaust stack, ventilates the oven and provides the necessary means of removing the moisture, fumes, smoke, and waste products of combustion.

Transfer of heat from the heater to the cores is accomplished through a large volume of heated air at controlled temperature. A rapid circulation and recirculation assures maximum uniformity of temperature throughout the oven compartments. This feature permits rapid baking of small and large cores in the same oven without danger of burning or over baking.

This installation also incorporates recent developments by the Foundry Equipment Co., in the construction of its rolling drawer core ovens. A combination of ball bearing equipment in the overhead drawer carrier, together with frictionless differential rollers supporting the rear end of the individual drawers, permits handling of the most delicate cores without danger of damage through vibration or distortion. A separate operating handle is provided for each drawer. Any single drawer or combination of drawers may be withdrawn at one time. When drawers are withdrawn, the rear plates on each drawer, automatically close the openings to prevent any escape of heat or fumes.

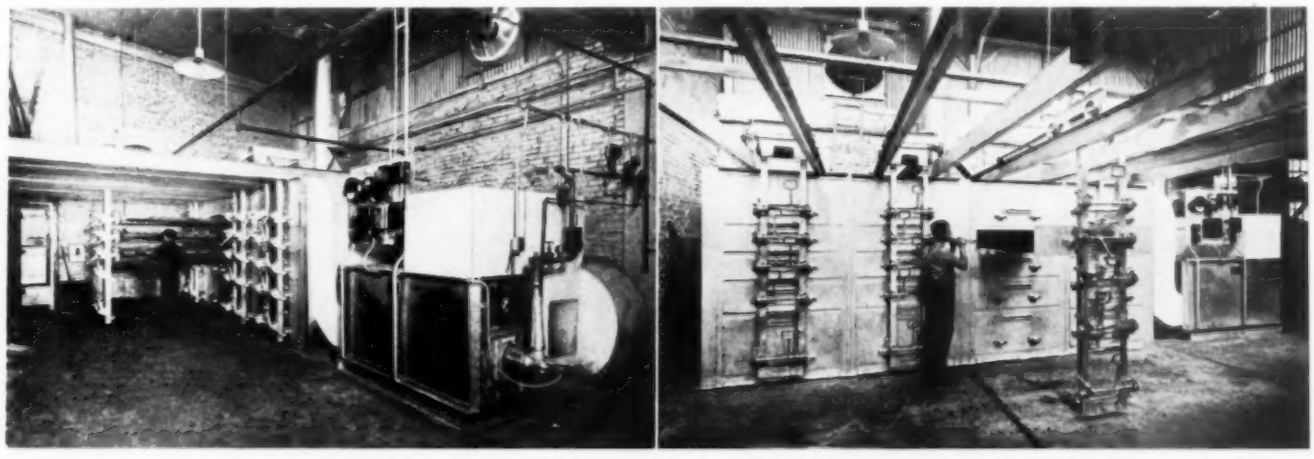
The heater has complete safety equipment which serves automatically to shut off the gas in case of power, flame or fuel failure. Through a time-delay relay, the fan must be operated for a definite period to thoroughly purge the oven when starting up, before gas is available.

## Book Review

*Chemical Analysis of Metals and Alloys*, by Edwin Gregory and Walter W. Stevenson, cloth, 376 pages, published by the Chemical Publishing Co., New York, and supplied by THE FOUNDRY, Cleveland, for $6, and in Europe by the Penton Publishing Co. Ltd., London.

This book describes methods of metallurgical analysis, confining attention to methods considered reliable, accurate and speedy. The first part of the book deals with the fundamental principles of physical chemistry, the chemical properties of the elements and their compounds and the physical principles involved in general analytical technique. The second part of the book deals with the actual analytical methods.

Committee E-7 of the American Society for Testing Materials on radiographic testing is engaged in studies preliminary to development of acceptable standards and recommended practices covering acceptability and applicability of radiographic examination. Work of the committee is to develop recommended technique and to carry on research to improve sensitivity and reliability of that method of inspection.



**A battery of four rolling drawer core ovens is heated by a single gas-fired external heater**

# Chilled Car Wheels

(*Continued from page* 34)

with two cupolas lined to 80 inches inside diameter and operated on alternate days. The greater part of the cupola charge consists of wheels worn out in service and returned by the railroads in partial exchange for new wheels. These wheels are rolled one at a time under a breaker where a heavy tup descends with great force and breaks them into several pieces.

The broken wheels fall into a charging buggy where other component parts of the charge are added. Each charge contains 6000 pounds made up of two buggy loads of 3000 pounds each. The charge contains a definite number of pounds of silicon, manganese, phosphorus and sulphur. Approximately 20 per cent silicon and 25 per cent manganese are lost in the melting process. Allowance for this loss is made in calculating the charges so that the iron as tapped from the cupola is of the proper composition. Each remelting is a refining process for it restores all the elements in proper balance and removes oxides and foreign inclusions.

In ordinary cold blast cupola operation one pound of coke will melt 9 to 10 pounds of iron. In the present instance where hot blast is employed it is claimed that 1 pound of coke melts from 12 to 14 pounds of iron. This economy of fuel is brought about by preheating the blast to a temperature of between 300 and 600 degrees Fahr. Heat recovery is accomplished by withdrawing the gases of combustion from the cupola just below the charging door, passing them through the combustion chamber in which the combustible gases are ignited to develop a temperature of about 1700 degrees Fahr., then through passes of cast iron tubes and finally discharged to the atmosphere through an exhaust fan. Air for the cupola is driven by a pressure blower between the heated tubes on the way to the cupola.

### Metal Purified in Ladle

Iron is tapped from the cupola at a temperature of 2700 degrees Fahr. It may be tapped continuously or intermittently into an open tilting reservoir ladle of 12 tons capacity, sufficient for a half hour of pouring requirements. This arrangement gives the iron a chance to purify itself of slag and occluded gas. The operation further is intensified by the addition of soda ash which forms a fluid slag and removes sulphur and other impurities.

To check the chilling properties of the iron, test pieces are poured and broken 5 or 6 times per hour. These test pieces are poured with the narrow edge against a chiller. The piece remains in the sand about 6 minutes. It is removed and exposed to the air for 3 minutes and then cooled in water. It is then broken with a hammer to expose the fracture. Different depths of chill are controlled by using various silicon concentrations. For standard railroad wheels the required silicon content is approximately 0.55 per cent.

This produces a chill depth on the test piece of 1⅞ inches, which is from two to two and one half times greater than the desired depth of chill on the wheel. When the metal in the ladle has been checked for its chilling properties as indicated by the depth of chill on the test piece, it is poured at a temperature of about 2500 degrees Fahr. into portable ladles which hold enough metal to pour two wheels. These small ladles mounted on buggies move backward and forward on a depressed track in front of the reservoir ladle. Each one is picked up in turn by a crane and taken to the pouring station.

The operator manipulates the stopper mechanism to fill the mold in an average time of 10 seconds. The stopper then is lowered into the nozzle and the conveyor moves forward to bring the next following mold under the ladle.

### Wheels Shaken Out on Time

The interval between pouring and shaking out is about 45 minutes. The pouring station is adjusted so that the wheel arrives at the shakeout station at the proper time. It is very important that the wheels be shaken out as soon as they have solidified. If delayed, the excess cooling of the tread as compared with the hub produces serious and injurious shrinkage strains.

Cope and casting are raised by a bail equipped with a vibrator, conveyed to a point over the landing place where a few vibrations cause the wheel to fall from the cope. The flask is swung back over a grating in the floor where the vibrator removes all the sand. The hot sand falls into a bin under the floor while the empty flask is returned on gravity roller conveyor to the molding station. The drag part of the mold also is raised by a vibrating bail, swung over the grating in the floor and treated in a similar manner. An exceptionally comprehensive exhaust system sucks air and dust through the grating.

To compensate for the usual sand loss, a shovelful of new sand is placed on top of each cope just before it arrives at the shakeout station. Old and new sand fall through the grating into a hopper and thence onto a reciprocating conveyor in a tunnel under the floor where water is added. The sand then is elevated to a riddle where more water is added. It is then dropped on to a belt conveyor which carries it to the permanent storage bins. Permeability, bond and moisture content are tested every hour.

From the shakeout station the hot wheels, average temperature 1500 degrees Fahr., are taken to

(*Concluded on page* 80)

Fig. 4—A transfer car operated by a cable brings the ladles in turn under the spout of the reservoir ladle

$34.00

**SLY PURAIR (SANDBLAST) HELMET**

*Approved by*

**U. S. BUREAU OF MINES**

PERMISSIBLE
SUPPLIED-AIR RESPIRATOR, TYPE CE

APPROVAL NO. 1911

ISSUED TO THE
W. W. SLY MANUFACTURING CO.
Cleveland, Ohio, U. S. A.

Approved for respiratory protection during abrasive blasting in any atmosphere not immediately harmful or from which the wearer can escape without the aid of the respirator. This approval applies only when the respirator is supplied through 15 to 50 feet of hose with respirable air within the pressure range of 3 to 9 pounds per square inch as specified by the manufacturer. Approved only when the assembly consists of respiratory inlet covering, (helmet) BM 1911, hose, BM 1911; and harness, BM 1911.

CAUTION

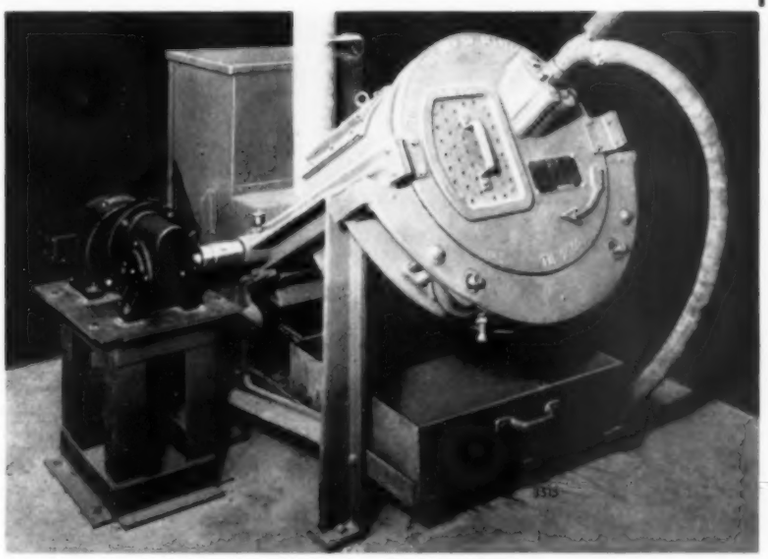
This respirator must not be worn in any atmosphere immediately dangerous to life. Follow the manufacturer's instructions for providing a supply of respirable air, for installing, adjusting, using, cleaning, maintaining, and storing the device.

Meeting all government specifications the Sly Purair Helmet for Sand Blast operators, consisting of helmet proper with a shatter-proof glass window, belt and air supply hose between the belt and helmet is priced to you at $34.00. The complete equipment, consisting of a Sly Compressed Air Filter and Purifier, $9.50; Air Pressure Gauge, $1.00; Air Pressure Regulating Valve, $2.50; 15 feet of ½" I.D. x 15/16" O.D. Special, non-kinking, non-collapsing, flexible air hose and fittings at $3.50, can *now* be shipped to you from stock for a total of only $50.50.

*At this low price no plant should be without Government endorsed* ***SLY PURAIR HELMETS.***

# *See* SLY *for Savings*

## ON YOUR *BLAST CLEANING* NEEDS



**Whatever blast cleaning problems you may have, Sly products—from dust helmets to huge blast mills and rooms—are designed to economically and effectively give you a positive solution.**

***For Example,*** **you find the *Sly No. 4 Tilted Blast Mill* efficiently cleans any small size, shape, design and weight of annealed malleable, steel, gray iron or non-ferrous castings . . . averts investment in large equipment by small foundries . . . eliminates the expensive operation in cleaning small lots of castings in large cleaning equipment which you already have.**

**The Sly Tilted Blast Mill has a barrel 20" deep and 20" inside diameter with an 11" x 9" loading door. The effective load capacity is approximately 1½ cu. ft. which can weigh from 100-200 lbs. A ½ H.P. motor is adequate for operating the mill.**

**The mill is equipped with an induction blast gun having a ¼" wear resisting air orifice, which assures constant air consumption at different blasting pressures and only requires a small volume of compressed air. 544 cu. ft. of air per minute is adequate for ventilating the mill and air-washing the abrasive. If your existing filtering equipment cannot be suitably connected to the mill a small, inexpensive Sly Unit Filter is available.**

*"See Sly for Savings" on your blast cleaning problems. Consult a Sly Engineer or write for the Sly No. 4 Tilted Blast Mill Bulletin FS-82.*

See.. SLY For Savings

**THE W. W. SLY MANUFACTURING COMPANY**

*Blast Cleaning Equipment • Tumbling Mills • Dust Control Equipment for Every Industrial Purpose*

4700 TRAIN AVENUE, CLEVELAND, OHIO • BRANCH OFFICES IN PRINCIPAL CITIES

(*Concluded from page 78*)

the soaking pits. These modern soaking pits are built in groups of from 10 to 20 where the temperature is maintained at approximately 1300 degrees Fahr. Heat from oil fired flues passes through checker work surrounding each pit. In this uniform temperature all the wheels receive identical heat treatment. After 24 hours the wheels are removed while at a temperature of 1300 degrees Fahr., and are removed to secondary pits where they are allowed to cool to room temperature.

### Pass Series of Severe Tests

The wheels remain in the cleaning room one day and then are passed through a sandblasting device. After the wheels have been cleaned, chipped and taped they are passed over a scale where a permanent record is made of the weight, tape size and result of critical inspection for any defects.

After inspection at the scales certain wheels are selected by the manufacturer for thermal and drop tests before the wheels are offered for railroad inspection. In the drop test the wheel is placed in a horizontal position with the flange resting on three anvil blocks supported by a casting weighing 1700 pounds or more. This casting rests upon a concrete base. A weight of 250 pounds is raised to a designated height according to the weight of the wheel to be tested. The weight is allowed to fall on the front hub of the wheel. According to A. A. R. specifications the wheel must withstand 12 or more blows to be accepted.

The thermal test consists of molding a channel 2 or 3 inches wide around the entire circumference of the wheel and filling it with molten iron. Violent stresses are induced in the plate of the wheel by the rapid heating and expansion of the tread metal while the plate and hub remain cool. Formerly the test was conducted for a period of 2 minutes. In modern wheels the manufacturer doubles the thickness of the ring and places no limit on the time. Offhand one cannot call to mind any other type of gray iron casting subjected to such severe and rigorous test before acceptance.

The Research Association of Manufacturers of Chilled Car Wheels maintains exceptionally well equipped physical and chemical laboratories and research department at the plant of the Griffin Wheel Co., Chicago. The work is divided into three groups: First—Definite programs of research, study of heat treatment, effect of varying the normal elements in the metal, and investigation of individual and combinations of alloys in wheel iron. Second—Investigation of individual wheels sent in by wheel manufacturers and also by railroads.

Study of wheels from individual manufacturers usually is for determination of the effects of some changes in composition or method of manufacture. Wheels from the railroads generally are wheels that failed in service. These are examined thoroughly and analyzed to determine the factors which may have had a weakening effect. Information is supplied manufacturers with suggestions to assist in eliminating the defects. Third—Collecting and classifying statistical information on wheel service and railroad traffic as it reflects the work performed by the wheels. This activity is under the general direction of F. K. Vial, vice president in charge of Research Association of Manufacturers of Chilled Car Wheels.

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Harnischfeger Corp., Milwaukee, has appointed L. T. McGuire Pacific Coast representative, with offices in San Francisco. Mr. McGuire formerly was manager of the excavator division of the corporation.

## Book Review

*Graphic Routes to Greater Profits*, by John W. Esterline, fabrikoid, 320 pages, 8½ x 11 inches, published by the Esterline-Angus Co., Indianapolis, Ind., and supplied by THE FOUNDRY, Cleveland, for $3 and in Europe by the Penton Publishing Co. Ltd., London.

That graphic instruments can aid in increasing productive capacity and efficiency of industry is brought to attention strikingly in this interesting book through numerous, but pertinent examples where that type of instrument has solved problems. The selected examples necessarily are brief, but pointed, and cover almost every field and industry.

The book contains an introductory section divided into three parts which discuss high cost of inefficiency, what graphical representation means, and classification of industrial problems. The remainder of the book is divided into five divisions relating to problems of power, problems of machines, problems of processes, problems of men, research, and special problems. It should be of considerable interest to engineers and executives because it is a practical contribution to the art of applying scientific methods to conduct of industry, and discloses the technique of critical examination and diagnosis of industrial operations.

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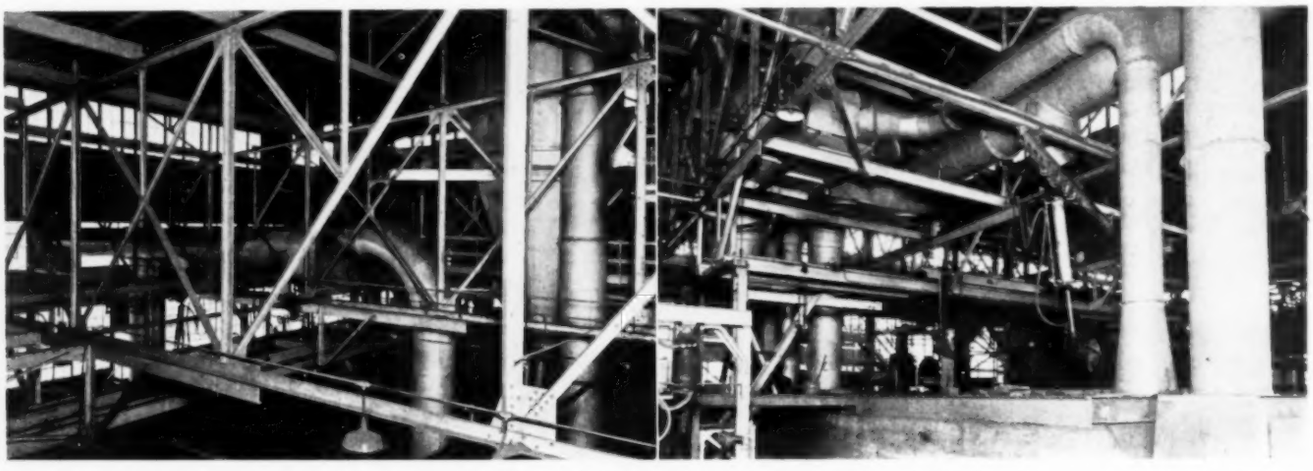
## Issues Revision

American Society for Testing Materials, 260 South Broad street, Philadelphia, has issued revised tentative specifications for fuel oils and a new tentative method of test for sediment in fuel oil by extraction. The fuel oil standard is designated D396-38T, and the test method for sediment as D473-38T. Copies of these may be obtained from the society for 25 cents each.



**Figs. 5 and 6 (Left and Right)—An elaborate system of piping connected to powerful exhaust fans removes all dust and fumes from the area where the molds are shaken out**

# Among Detroit Foundries

(*Concluded from page* 35)

torily. The extra equipment is of about double the capacity of the unit now in service.

Should efforts fail to make the combination forehearth and stack an efficient production unit—fail is a word difficult of understanding by Ford engineers—it is possible erection of another type of melting unit will be considered. Plans have been drawn and now are held in the drawer until the current project is terminated. The new unit resembling a rotary cement kiln, is about 42 feet long and 5 feet in outside diameter and tilted at an angle of about 3 degrees from the horizontal. The front or tapping end is lower than the rear end which connects to a stack. There is a chute set up at the stack end through which material may be charged. A single burner fires through the front end and the flames sweep through the cylinder and preheat the incoming scrap.

The installation of course represents a variation of the Brackelsburg principle, and in fact the rotary unit can be made by removing the cones from six Brackelsburg shells and bolting the flanges together. It should prove to be quite a spectacular melting system ever placed in operation.

### Late Silicon Addition

Returning to the scientific control of iron quality, there has been much discussion in recent foundry literature over the value of *late* or ladle additions of silicon to cupola iron. Several foundrymen in this vicinity are experimenting with late additions and finding it possible to realize important increases in strength, ductility and impact resistance of the resulting gray iron. Increases in strength up to 30 per cent are reported.

By adding small amounts of ferrosilicon to the iron in the ladle, the increased silicon content appears to confer advantages beyond what it would if built up in the cupola charge. From an economic standpoint, late additions are said to involve no extra cost, since a 20-point increase in silicon content brought about by the late addition of 0.75 per cent ferrosilicon can be compensated by using a pig iron with lower silicon content in the charge, thus saving on this score practically enough to meet the cost of the ferrosilicon addition.

A new material recently introduced into this territory for use either in the cupola or as a ladle addition is known as Ferrocarbo and has silicon carbide as an essential ingredient. Through its use it is possible to use harder charges containing higher percentages of steel and scrap. It is claimed that combination of the addition agent and the harder charge refines the grain and the graphite structure and produces machinable metal.

The material is available in briquet form for cupola iron and in granular form for use as a ladle addition for cupola, air and electric furnace irons. When used as a ladle addition carbon and silicon pickup depend upon the iron temperature and the percentage of material added, but are subject to control.

Two large foundries here are experimenting extensively with another type of material to control deoxidation and hardening of gray iron. This is a fused mixture of four metals and is reported to cost about $1 per ton of iron processed. Preliminary work involving the use of the material in cylinder block iron indicates it is possible to obtain bore hardness considerably above what has been achieved in production, at the same time leaving machinable panrails and manifold faces.

### Places Sleeves in Cylinders

Cylinder block bore hardness versus machinability of block surfaces is a lively subject for discussion in foundry circles. Some men hold to the opinion the only satisfactory solution ultimately lies in the use of liners in the cylinder bores. In fact, it is reported on good authority that Ford will use a dry sleeve on all engines for next year's cars.

The dry sleeve is so called because it does not come into direct contact with the engine cooling water. Usually the dry sleeve is shrunk into the machined cylinder bores by freezing with dry ice or other means. These sleeves have been used on some Ford engines for taxicab and commercial car service, but application of the idea to passenger car engines is new, and probably will serve to silence certain complaints on the score of excessive oil consumption in engines after they have passed the 20,000-mile mark.

Another rumor around Detroit is that Ford will extend the use of cast alloy valve seat inserts to intake valves on new engines. These inserts are used widely throughout the automotive industry in exhaust valve seats, but only the more expensive engines use them for intake valves. The Ford alloy is a combination of copper, chromium and tungsten, with smaller percentages of silicon and manganese and 1.20-1.40 per cent carbon.

On the subject of foundry control, it is of interest, even to operators of small and medium size foundries, to note the increasing care given to core practice in the automotive industry. Buick has just completed what is considered to be the last word in equipment for handling, treatment and mixing of core sands. Elaborate precautions are taken to dry all sand thoroughly. Mixing of the correct proportions of lake and bank sands is held within precise limits by accurate weighing.

Not so many years ago preparation of core sand involved nothing more complex than taking so many wheelbarrow loads of lake sand, so many wheelbarrows of bank sand and so many buckets of oil, then mixing the batch for a while and proceeding with forming the cores. On the theory that a casting is no better than the core used, progressive foundries have traveled a long distance from the above hit or miss method.

Economy is shown by Sheffield Steel Corp., Kansas City, Mo., in the use of a cupola to supply hot metal to openhearth steel furnaces. Located in an agricultural section of the country, supplies of agricultural scrap at low price readily are available. Melted in the cupola, the hot metal makes an ideal open hearth charge, and steelmaking costs have been lowered by this unusual combination.

### Personalities

Russell Scott and Kurt Babo, well-known in local and national foundry circles, are no longer associated with McKinnon Industries, St. Catherines, Ont. Mr. Scott at one time was active in direction of the Packard foundry and later was associated with the Pontiac foundry. Mr. Babo formerly was associated with foundry developments at Dodge and Kelsey-Hayes.

Frank Riecks, connected with the power and construction department of Ford Motor Co. has left for France where he will supervise a movement of Ford operations from Strasbourg to Paris. His sudden departure has kindled rumors that hostilities in Europe are nearer than many people imagine.

John E. Linabury has been brought back by General Motors to the Saginaw Malleable division of the corporation from the McKinnon Industries plant where he designed and built gray iron and malleable foundries. In his new position he will supervise development work, probably taking a major hand in extending the use of pearlitic malleable iron to a number of GM parts, crankshafts, camshafts, rocker arms, axle housings, and the like.

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United States Smelting Refining & Mining Co., 57 William street, New York, for many years one of the leading producers of silver and lead, will produce zinc and sell directly to the trade.

# Brass Foundry Cores

(*Continued from page 29*)

tightened up by the presence of enough fine sand to give satisfactory results. Also the surface of the core must be washed with a suitable graphite or talcum wash, or some other commercial core wash available which by experiment has been found to give a satisfactory type of surface for the work in hand.

Mixing the binder with sand is a most vital step in getting best results from any given ratio of sand to bond. Obviously, each grain of the sand should have its proper proportion of binder. Therefore, a thorough mixing is the only way of insuring proper distribution of binder throughout all the grains of the sand. Few people seem to realize the importance of thorough mixing. Frequently, they depend upon turning over the mixture with a shovel several times instead of putting the sand and binder in a mechanical mixer and determining the proper mixing time to secure best results.

### Add Oil Before or After

There is some debate as to whether the water should be added to the mixture before the oil, or the oil precede the water. All the core sand mixtures of course contain some water; approximately 4 per cent being the desired and most satisfactory amount. If the sand to be mixed has been dried thoroughly before measuring it for the making of a batch, those who contend the oil should be added first are justified since dry sand is wetted more easily with oil than if the sand is wet.

If the sand already has a small moisture content, it would seem then that the water might be added first without materially affecting the distribution of the oil bonding material. The important factor is to insure the uniform distribution of the oil bond throughout the batch of sand.

If the sand mix has some molding sand added to it a definite amount of clay is added to the batch. Oil and clay react upon one another so that the bonding ability of either is somewhat reduced. Therefore, with clay in the core sand batch, a little more core oil will be necessary to secure the same amount of baked core strength as obtained with a clay-free batch.

Where the pouring temperature of the alloy is low and consequently, the effect on breaking down of binder is low, the amount of core oil should be the absolute minimum. In many instances a ratio of 80 to 1 of sand to oil has developed satisfactory cores where low melting point alloys were poured. Some zinc-base and some of the aluminum-base alloys are cast against such cores.

Some foundrymen employ other types of binder for the production of cores that are not going to be subjected to high temperatures. Some use molasses water, others use cereal binder, dextrine, etc. It is a matter of experiment for each foundryman to determine what type of binder he may prefer for the kind of alloy he is pouring and the kind of work he regularly is producing.

The all important factor is to have a minimum amount of gas forming material and just enough binder to hold the core in true normal shape until the casting has set and then have the core sufficiently decomposed so that it can be removed from the casting readily.

### Comes Baked in Three Stages

A core of a given core mixture can be affected materially by the baking process. The baking process consists of three essential steps. First, vaporization of the moisture content until it has passed away, tends to keep the temperature of the core down. Vaporization must not be too rapid, since too high a temperature converts the water to steam too suddenly, expanding it to a point where it may distort the core and cause swelling or even cracking of the core during baking.

The next step is to evaporate the volatiles from the oil binder. Those should not be driven off too rapidly since they may likewise distort the core and may open the surface. Therefore, vaporization of volatiles from the oil should be done gradually and that requires a relatively low temperature of baking—about 350 to 400 degrees Fahr.

The third step in baking is that of bonding the sand by oxidation of the remaining oil after the volatiles have been driven off. The oxidized oil then holds the sand grains together, thus bonding the core and giving its best baked strength. Strength after baking is somewhat dependent upon the degree of oxidation. If the core is baked so that oxidation is carried to an excessive extent the baked strength begins to fall off, and yet, if the baking is not carried far enough, the full baked strength is not realized.

Further, if the moisture and volatiles are driven off rather rapidly, they tend to carry with them some of the oil and deposit it at the surface of the core, thus increasing the baked strength at the surface and reducing some strength within the core. Where molasses water or cereal binders are used, the proper baking temperature may be slightly lower and the speed at which the core should be dried should be reduced to give best results.

Core coating or surfacing materials may vary with different types of castings or of alloys. Where the alloy is of the high lead type which tends to have a searching effect and penetrate the core, the core must be coated with some good type of core wash, particularly where the walls of the castings are of heavy section or where the casting itself is very heavy, and in addition it is under heavy pressure due to large risers.

A wide variety of core washes is available. A good plumbago wash having just enough fire clay to bond it to the core gives satisfactory results. Plumbago washes already mixed are marketed regularly by foundry supply houses. Cores which are coated should be dried well and then subjected to a moist atmosphere for a minimum length of time. They should not be placed in a green sand mold until just before the mold is to be closed.

There are occasions where the pressure on cores is so great, due to heavy risers and heavy section, that a regular core wash has not sufficient resistance. In such cases some of the furnace cements on the market serve satisfactorily. In some instances cores have been surface washed with portland cement.

### Apply Heavy Coating To Surface

Some foundrymen have found it desirable to use a paste rubbed by hand on the surface of the core. The paste is made of flake graphite mixed with a minimum amount of core oil. After application the core is dried in the oven.

Where the core is subjected to conditions under which the metal tends to penetrate the sand through heavy pressure, type of alloy used, or a combination of both, the core sand must be of the right kind. Pure silica sand mixed with a satisfactory amount of fine silica sand dust will give a smoother surface due to the fines filling up the interstices between the coarser grains. In addition if the core is coated with a core wash, it will tend to resist penetration much more satisfactorily than if the core is made up entirely of the coarser grains.

With large cores it is a simple matter to cover the surface of the core box with a mixture of coarse and fine grain sand and then fill up the interior of the core with coarser sand or even with larger materials, such as gravel and pieces of coke to produce a free venting interior structure. However, the surface of the cores must resist penetration of the metal so that it does not fill up the vents.

Recapitulating it may be stated that good core practice demands: A free venting core with a minimum amount of binder for the serv-

(*Concluded on page 86*)

*A Roto-clone*

# DUST CONTROL SYSTEM

*installed entirely in*

## OVERHEAD SPACE

Foundry floor space is nearly always at a premium, consequently, dust control equipment capable of being installed overhead and out of the way is highly desirable.

These photographs taken in a large Michigan foundry show two "overhead" Roto-Clone installations. Roto-Clone No. 1 exhausts the shakeout—Roto-Clone No. 2 exhausts the sand handling system. The compact design of the Roto-Clone, and its strategic location to the operations it serves, is illustrative of the practical adaptability of the Type W Roto-Clone to foundry dust problems.

*Write for Bulletin No. 276.*

**AMERICAN AIR FILTER CO., INC.**

Incorporated
116 Central Ave., Louisville, Ky.
In Canada: Darling Bros., Ltd., Montreal, P.Q.

TYPE W

# ROTO-CLONE

*For Foundry Dust Control*

(*Concluded from page* 84)
ice intended, and as smooth a surface as conditions will permit.

A core having sufficient green sand strength to insure retaining true size and shape until it is baked, and to permit economical handling in productions so that the labor cost of core production is at a minimum.

A core having sufficient baked strength to withstand the stresses of handling from core room to mold without breakage or other harm, and to withstand stresses of casting metal around it.

A core that will break down readily under the effects of the molten metal and thus enable it to be removed easily after the casting is set.

A core having sufficient baked strength to resist shrinkage strains set up during solidification of the casting but not having sufficient strength to cause contraction strains in the casting itself.

A core surface that will resist penetration or burning by the high temperature of the molten metal so that shape may be maintained while the casting is solidifying.

# Foundrymen To Meet in London

By VINCENT DELPORT
European Manager
The Foundry

NEXT year, 1939 will be one of outstanding interest in the history of international foundry congresses. This congress will be held in London, largest capital in the world. It will be the occasion to assemble in the interests of the foundry industry what, it is hoped, will be the largest attendance of English speaking foundrymen from every part of the world. Members of the American Foundrymen's association who attended the 1929 congress in London remember the interest and variety of the program offered. Many casual acquaintances started on that occasion, have developed into lasting friendship. Organizers of next year's international congress hope the greater number of visitors of ten years ago will come again and bring a host of new friends.

At the meeting of the International Committee of Foundry Technical associations held during the congress in Brussels in 1935, J. E. Hurst, president of the Institute of British Foundrymen, issued an invitation for a Congress *A* to be held in Great Britain in 1939. *A* congresses carry full official participation of the American Foundrymen's Association. The invitation was accepted unanimously by representatives of the technical associations of the ten countries represented on the committee.

At the conference of the Institute of British Foundrymen held in Derby in June, 1937, a small committee was appointed to go into a preliminary study of the main features of the international congress. In the early fall an organization committee was set up, which held its first meeting on October 13, 1937.

Date set for the congress is from Monday, June 12, to Friday, June 30, 1939. The period probably is the most favorable from the view point of climatic conditions, and will afford visitors a view of the country at its best. Industrial activities normally are in full swing in anticipation of the usual let down that follows during July and August. June is one of the most interesting months of the year in regard to facilities for social gatherings and entertainment. The contemplated program will include a variety of features, technical and social to satisfy the wishes and tastes of both men and lady visitors.

W. B. Lake, chairman of Lake & Elliott, Ltd., Braintree, Essex, and elected senior vice president of the Institute of British Foundrymen at the conference held in Bradford last June, will be president at the time of the international congress. Mr. Lake's numerous friends in the United States and elsewhere will remember his genial and friendly personality at the time of the 1929 congress in London.

Broad lines of the congress program now are advanced sufficiently to be stated. The first week will be spent in London, where the opening ceremony will be held under the patronage and in the presence of leading government, civic and industrial personalities. Two days will be devoted to presentation and discussion of papers. The remaining time will be given up during the daytime to works visits in the vicinity of London. The program for social gatherings and entertainment in the evenings is well advanced. A banquet will be held on Wednesday or Thursday evening. Friday will be devoted to an all-day excursion probably up the River Thames and including a visit to Windsor castle.

A post-congress tour is being arranged, to last one or two weeks according to the time visitors have at their disposal. The tour is scheduled to commence on Sunday, June 18. An opportunity will be given to visit Shakespeare's country, and Lulgrave Manor the ancestral house of George Washington's family. Members will then travel to Birmingham, Derby, Sheffield and Manchester. Throughout that part of the tour visitors may choose between a wide variety of the most interesting works in the country. Special visits will be arranged for the ladies. Informal social gatherings and receptions will be organized for all the members in the evenings.

On Saturday, June 24, members will leave Manchester in the late afternoon for Windermere, a noted beauty spot in the lake district. During Sunday the whole district will be traversed as far as Keswick where members will entrain for Glasgow.

Activities of the second week of the tour will commence at Glasgow Monday, June 26, will be devoted to a steamer trip down the river Clyde, which will afford the visitors a view of numerous famous shipyards, in particular that of Clydebank where the QUEEN MARY was built and her sister ship QUEEN ELIZABETH is being completed. Tuesday, June 27, will be given up to works visits in the vicinity of Glasgow. On Wednesday members will be taken to Edinburgh, one of the most beautiful cities in Great Britain, full of historical associations. From Edinburgh the party will go on to Newcastle-on-Tyne, one of the leading industrial cities of North-East England, and thence back to London where members will arrive in the late afternoon Friday, June 30.

Throughout the congress, in London as well as during the post-congress tour, a special program is being arranged for the ladies and special endeavors are being made to provide for periods during which the visitors may enjoy a few hours of free time and rest.

American visitors may be assured that every endeavor will be made to make their stay in Great Britain fruitful, interesting and pleasant, in an atmosphere of friendliness and goodwill.

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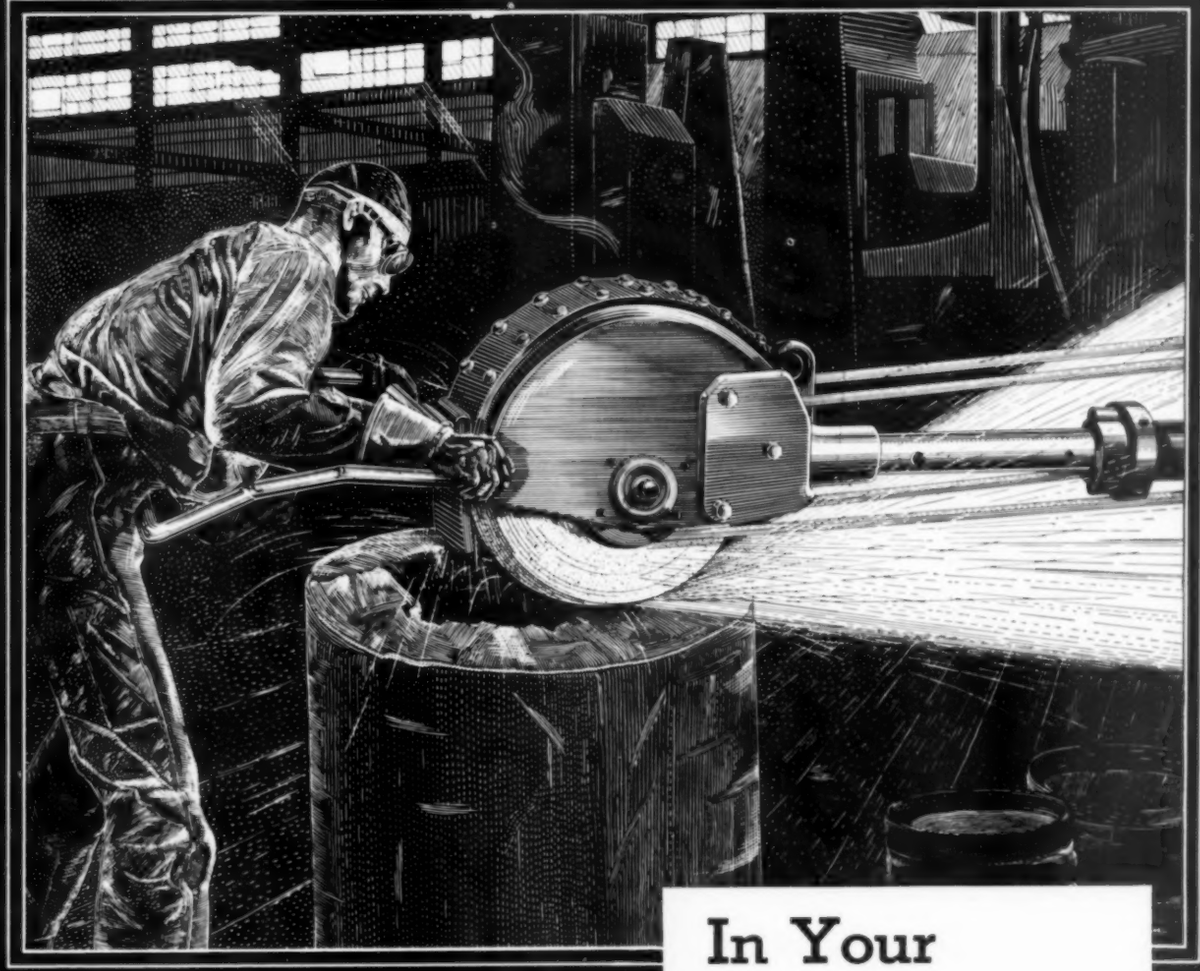
A description of the Columbia river area, its transportation facilities, power supply, and available raw materials is presented in a volume entitled "Feasibility of the Production of Ferroalloys in the Columbia River Area," by R. M. Miller, and available through the War department, office of the division engineer North Pacific division, 523 Pittock block, Portland, Oreg., for 50 cents.



## In Your Foundry

we can prove to you by actual performance tests that Norton foundry wheels are best for your requirements. No matter what kind of castings you make, Norton engineers—foundry specialists—can select from the complete Norton line the exact wheels necessary to get production at rock bottom grinding costs.

**NORTON COMPANY**
Worcester, Mass.

W364

**NORTON ABRASIVES**

# Duplexing Malleable Iron

(*Continued from page* 24)

molder hopper. Previous to its delivery to the molder, the sand passes through an aerator made by the Jeffrey Mfg. Co., Columbus, O. With this system, it is possible to control the properties of the sand to very close limits and desired properties.

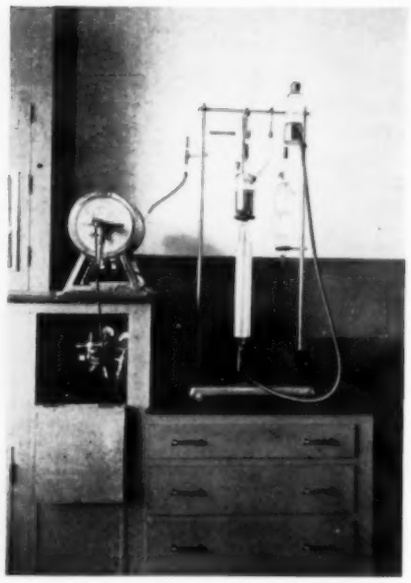


**Fig. 5—Apparatus for determination of carbon content**

The usual moisture content ranges from 4 to 4½ per cent, permeability 65, green compression strength 8 pounds per square inch, clay content 3 to 5 per cent and average grain fineness 65.

Quality of the floor heap sands is maintained through strongly bonded additions to the floor after the day's operation. Facing is used on much work. Conditioning of the heaps is carried out with sand cutters. Occasionally, when a floor becomes too low in permeability or strength, the entire heap is passed through the unit sand conditioning system, mentioned previously.

A record is maintained of the permeability and strength of each heap, and judgment is exercised in allotting jobs to the various floors. Castings of light section are made on floors with low permeability, approximately 25, while floors with permeability values of 45 to 70 are used for heavy work. The green compressive strength averages from 7 to 9 pounds per square inch, moisture from 4 to 5 per cent; the more open sands carrying the lower moisture content. Very little new or natural bonded sand is used.

The bond additions made to the heaps consist of gangway sand composed largely of core sands and burned sand from castings. This sand is conditioned with 16 per cent high grade bentonite in an intensive mixer made by the National Engineering Co., Chicago, and delivered to the floor. This conditioning system for the heap floors consists of two ½-ton mullers, each having a 50-ton storage hopper. Each muller is equipped with an aerator, through which the sand is discharged.

Preparation of molding sands in the heaps for bench and floor molding is being influenced by the molding sand requirements for the mechanized molding unit. That is, the former practice in preparing 48 different heaps of sand with individual characteristics is giving way to the preparation of a uniform sand in which most of our work can be cast. The sand engineer is convincing the molding supervisor that sand of uniform grain grading, confined to 3 or 4 sieves with the clay and moisture content controlled, will produce a higher percentage of good castings in the inspection department.

### Washed Sand for Cores

A high grade of washed round grain silica sand is used for core mixtures. This sand is blended with 15 to 30 per cent bank sand and bonded with either oil, cereal binder, rosin, pitch or various combinations of these. The combination of the mixture depends largely upon the desired properties in the core, and the circumstances surrounding its use. The core mixtures are prepared in paddle type mixers and delivered to the core makers in buggies holding 600 pounds of sand. Cores are either hand rammed, or blown, and baked in powdered coal fired ovens at temperatures ranging from 300 to 450 degrees Fahr.; heavy cores bonded with oil being baked at the higher temperatures.

Owing to the size and shape of many of the cores, high green strength is often necessary so the core will not sag or otherwise change dimensions previous to the baking. Cereal is used for this purpose; oil also being used to give dry strength. It is interesting to note that the cereal bonded cores have stood in green sand molds several days and good castings have resulted.

Proper venting and high permeability are necessary to prevent blowholes in such cases. On a number of occasions castings that have a tendency to form hot tears due to core resistance, have given very low loss due to tears when cast in molds that have stood over a considerable period of time. Cores in such molds have absorbed over 2 per cent of moisture and, of course, have very low compression resistance.

The sand testing laboratory is located convenient to the molding floors and also the core department. A.F.A. standard equipment is used for analyzing the sands for clay, grain fineness, green and dry compressive test, permeability of both molding and core sands, tensile for core sands, hardness and moisture. A moisture tester supplied by Alpha-Lux Co. Inc., New York, is used to determine the moisture in core sand mixtures, and sand heaps.

Moisture determinations are unsatisfactory for core mixtures bonded with oil unless dried in a non-oxidizing atmosphere to prevent the oxidation of the oil. With the instrument, moisture content is based on the pressure of gas developed when water reacts with calcium carbide. A moisture determination can be completed in 1 or 2 minutes.

Batch type annealing ovens with a capacity of 35 tons of casting are used. Castings are packed in pots 4 high, using granulated slag for packing material. The ovens are fired from one end only with two burner entrances, using powdered coal as a fuel. The annealing cycle consists of about 24 to 30 hours of preheating, 28 to 32 hours of holding at 1660 degrees Fahr., and 66 hours of cooling.

Castings are removed from the oven when the thermocouples, located in the oven atmosphere, indicate a temperature of 1020 degrees Fahr., or less in the back of the oven. On an average, 1 ton of castings requires approximately 660 pounds of powdered coal; representing an annealing fuel ratio of 1 coal to 3 iron. Temperatures in the oven

(*Concluded on page* 90)

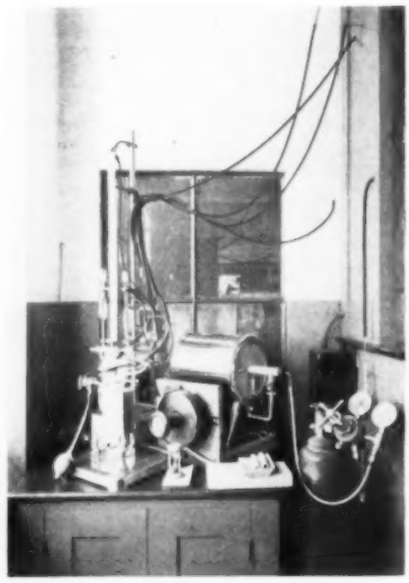
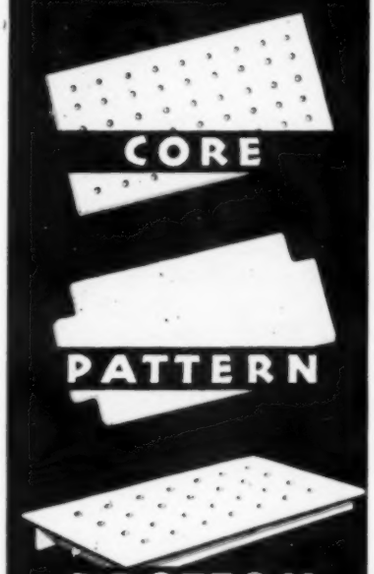
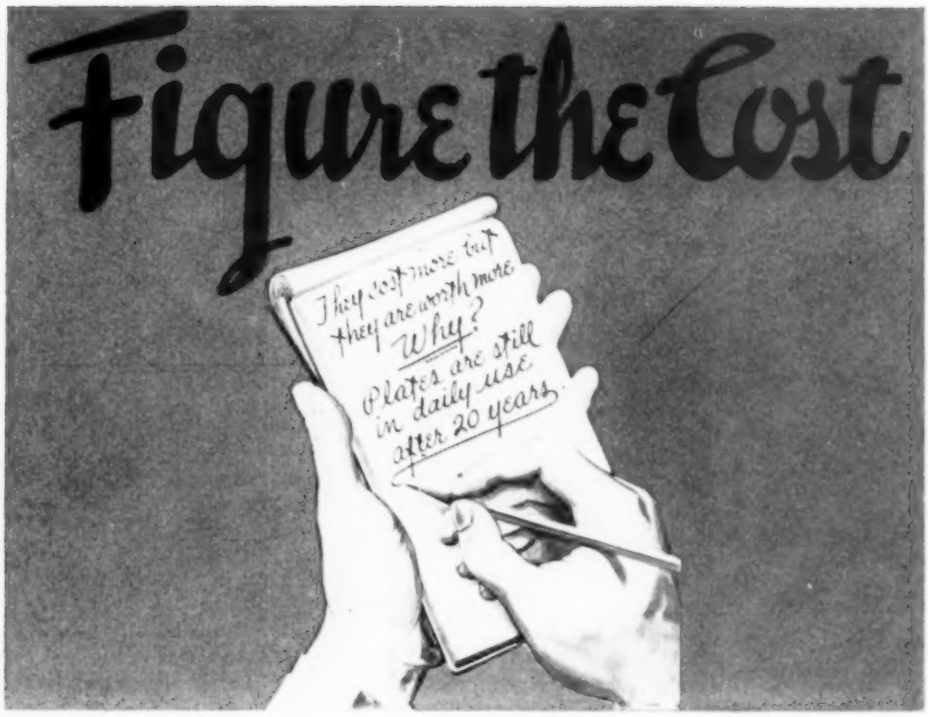


**Fig. 6—Sulphur content in the malleable iron is determined with this equipment**

MOLTRUP




PLATES

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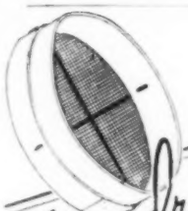

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RADIANT FACINGS Since 1879

(*Concluded from page* 88)
during the firing periods are maintained by flame and damper control.

Previous to annealing, the castings are given a preliminary cleaning operation to facilitate inspection for evaluating foundry losses. After annealing, gate and riser stumps are removed by power chisels and grinding operations, and given a thorough cleaning in airless shot blast units. Many castings are pressed in dies under powerful hydraulic rams previous to shipment. Owing to the rigid requirements and specifications of the customer, castings are made not only sound internally and free from external defects, but must meet close tolerances.

Mention should also be made of the procedure followed in establishing gating for new work. The gating practice is determined by several men old in experience, yet aware of the engineering properties required in quality malleable. Several possible methods of gating are used on a specific pattern, and the resulting castings are subsequently destroyed in the white iron state in search of internal defects.

After a certain type of gating practice has been found to produce sound castings, that gating is used to make castings from several consecutive heats of metal. If no defects are observed over several days practice, the gating practice is adjudged sound and a pattern made accordingly.

Malleable foundry practice is progressing from bench and floor molding to the modern conveyor line. This progress means that the responsibility for producing good molds is more dependent upon the molding supervisor. Likewise in preparing the metal by cupola and air furnace duplex melting, which is a fast and economical method, closer control and supervision are required by the metallurgist.

## Made Representative

Hickman-Williams & Co., with offices in Cleveland, Cincinnati, Chicago, Detroit, Pittsburgh, St. Louis, New York and Philadelphia, has been made exclusive sales representative for the National Metal Abrasive Co., Cleveland.

National bureau of standards, Washington, has published an 18-page bulletin entitled "Reference Tables for Iron-constant in and Copper-constant in Thermocouples," by W. F. Roeser and A. I. Dahl. Copies of the bulletin which is designated research paper RP1080 may be obtained from the superintendent of documents, Washington, for 5 cents each.

# Solves Foundry Problem

(*Concluded from page* 25)

Air within the area surrounded by the air curtain is removed by a centrally located exhaust system. Since a close balance can be maintained in the curtained area between incoming and outgoing air, it is claimed that air conditions in adjacent areas are not changed. That is particularly important in cold weather because heat will not be extracted from those adjacent areas.

Before proceeding with the description of the air curtain ventilation system installed in the foundry of the Crucible Steel Casting Co., Cleveland, it should be mentioned that from time to time considerable difficulty was encountered from smoke and fumes generated by the electric steel melting furnaces which billowed out into the foundry proper.

As shown in Fig. 1 two electric melting furnaces are located in a side aisle adjoining the main foundry aisle. The aisle is about 30 feet wide extending the full length of the building, and the furnaces are approximately in the center of this aisle. As may be observed from the illustration, the furnaces are located just at the juncture of the two aisles, and even though the elevated roof section extends about 7 feet over that point, the smoke and fumes from the furnaces tended to flow past that point out into the main foundry aisle when adverse atmospheric conditions were present.

The air curtain or downdraft system as installed consists of two incoming air duct systems which bring in the air to form the curtain, and a central stack for removing air, smoke and fumes from the area to be ventilated. One or both of the air ducts can be employed to meet the variable conditions encountered in foundry operations when one or both of the electric furnaces are in operation. The duct systems are located in front of the furnaces, and they form a U-shape arrangement extending across the front with wings on each side.

The ducts are egg-shape with the small end down, and a diminishing cross section to insure proper distribution of air. The opening along the edges of the ducts is continuous, but by sliding covers the discharge may be adjusted to direct the air current properly. The opening is designed so that the air is directed inward at an angle of approximately 20 degrees. Air for the duct is obtained through a short stack 36 inches in diameter with openings about 5 feet above the roof. A 36-inch airplane propeller type fan, direct connected to a motor and mounted inside the stack drives the air through the duct.

Removal of air, smoke and fumes from the furnace area is accomplished by exhausting into a 5-foot diameter stack extending 40 feet above the roof. The stack is enlarged at the bottom to form a rectangular section about 7 x 15 feet which contains two 36-inch diameter fans similar to the one in the duct. All fans were supplied by Propellair Inc., Springfield, O.

The enlarged section also contains two deflector cones arranged around the respective fans which cause an abrupt change in direction of the air current. The change in direction with decreased velocity due to increase in area causes the heavier dust particles to be thrown to the sides of the chamber, where they drop to a collector channel around the bottom.

Air flow between the incoming and outgoing air is adjusted so that the air curtain extends down to a level between 12 and 15 feet above the floor. Since installation of the air curtain or downdraft system of ventilation, the foundry of the Crucible Steel Casting Co. has been remarkably free from smoke and fumes from the melting department.

A similar forced air system has been installed over the annealing ovens where satisfactory results have been obtained during all stages of the annealing operation. Probably the most important feature is the extraction of heat and gases during the air quenching period.

The system was designed by and its installation supervised by O. D. Conover, consulting engineer, Cleveland. The schematic sketch shown in Fig. 2 indicates the flow of the air currents in the system.

## To Discuss Testing

Joint Committee on Materials and Their Testing (of Great Britain) will hold a meeting on Nov. 28 under the auspices of the Institution of Electrical Engineers, London. The subject will be nondestructive testing, and will discuss magnetic and electrical methods, x-ray and gamma ray, acoustical and general methods. Papers will be presented by Dr. B. Berthold, Reichs-Roentgenstelle, Berlin; Dr. A.P.M. Fleming; B. G. Churcher; J. E. deGraaf, Phillips Gloeilampenfabriken, Holland; V. E. Pullin; Dr. Koster, Kaiser Wilhelm-Institut fuer Metallforschun, Stuttgart; Dr. F. S. Dorey; N. L. Mochel, Westinghouse Electric & Mfg. Co.; H. H. Lester, Watertown arsenal, and R. L. Sanford, National Bureau of Standards.

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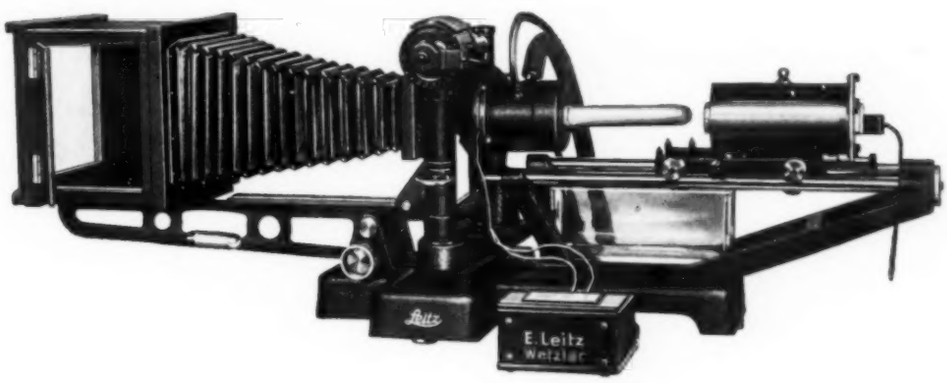


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# OBITUARY

NORMAN H. WASSER, 39, chief metallurgist, Lehigh Foundries Inc., West Easton, Pa., died Aug. 13 at his home near Bethlehem, Pa., after an illness of five months. Mr. Wasser was born in Hellertown, Pa., April 1, 1899 and attended the local schools and Bellefonte academy. He entered Lehigh university, Bethlehem, Pa., with the class of 1919, leaving to serve in the World War, but returned to graduate with the class of 1921. After a brief connection with the Bethlehem Steel Co., he entered the employ of the International Motor Co., Allentown, Pa., where he later became chief chemist. In 1937 he joined the Lehigh Foundries Inc. as chief metallurgist. Mr. Wasser was a member of the American Society for Metals, Engineers Club of the Lehigh Valley, and the American Foundrymen's association. He served the latter as a member of malleable division committee on program and papers, and also was a member of the technical council of the Malleable Founders society.

* * *

Frank H. Sloan, foundry superintendent, Union Metal Mfg. Co., Canton, O., died Sept. 6 in Baltimore.

* * *

Jonas L. Oberdorfer, 57, retired president of the M. L. Oberdorfer Brass Co., Syracuse, N. Y., died recently after a sudden heart attack.

* * *

Charles H. Scheerbaum, purchasing agent, the Abrasive Co., Division of Simonds Saw & Steel Co., Philadelphia, died Sept. 8.

* * *

Patrick Milroy, 72, formerly superintendent of the engineering department, Chicago Hardware Foundry Co., North Chicago, Ill., died at his home in that city Aug. 24.

* * *

Gordon T. Hoagland, grandson of Mahlon H. Hoagland Sr., founder of the Hoagland Foundry Co., Dover, N. J., died Aug. 14 following a heart attack. He was 58 and until recently operated the foundry.

* * *

Ben McCarthy, 44, superintendent of the cleaning department, Commercial Steel Casting Co., Marion, O., died recently in that city after a brief illness.

* * *

C. Parker Holt, 58, vice president and director, Caterpillar Tractor Co., Peoria, Ill., died Aug. 24 at his home in Piedmont, Calif. Born in San Francisco, Mr. Holt was the son of Charles H. Holt, who founded the hardwood lumber business from which the Holt tractor and harvester manufacturing activities were the outgrowth. Graduating from the University of California in 1902, he also attended Cornell university. In 1925, when the Caterpillar Tractor Co. succeeded the Holt Mfg. Co., he became export manager of the company. In 1926 he was made vice president, two years later was elected a member of the board of directors, and in 1934 became executive vice president. He had been with the firm for 40 years.

* * *

Carl L. Pfeifer, 58, treasurer of the Chain Belt Co., Milwaukee, died suddenly while on a visit to Philadelphia Aug. 24. Mr. Pfeifer was born in Chicago and received his education in that city. After leaving the employ of Arthur Young & Co., in 1914 he joined the Chain Belt Co., as comptroller. He was elected treasurer in 1916 and retained that position up to the time of his death. He was very active in, and at one time was director of the National Association of Cost Accountants and the Controllers Institute of America. For a number of years he was connected with the Milwaukee Goodwill Industries and was active in other charitable work throughout the city. He is survived by his widow, a daughter and two sons, G. Herbert with the Chain Belt Co., and C. Lowell an instructor at Marquette university, Milwaukee.

## Book Review

*Fundamentals of Design, Construction, Operation and Maintenance of Exhaust Systems*, 141 pages loose-leaf, published by the American Foundrymen's association, Chicago, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co., Ltd., London.

This new code, prepared by the Industrial Hygiene Codes committee of the association, compiles for the first time complete recommended practices covering the necessary engineering data required for designing and installing exhaust systems in gray iron, malleable, steel and nonferrous foundries. The tentative code is the third of a series, two previously published being "The Tentative Code of Recommended Practices for Grinding, Polishing and Buffing Equipment Sanitation," and "Tentative Code for Recommended Practices for Testing and Measuring Air Flow in Exhaust Systems."

As is pointed out by the committee, the code will be of interest to the personnel of small foundries as well as large. Considerable research was performed in developing the material with the result that some entirely new information and data are included on resistance losses or friction in straight pipes and elbows. The appendix gives an example of an exhaust system completely worked out step by step, showing the proper use of all the rules and formulas given in the text.

Some of the general information included may be found under the following headings: Theory of Air Flow in Exhaust Systems; Application of Exhaust Systems; Factors Affecting the Flow of Air in Exhaust Systems; Application of Collection Equipment; Air Flow Producing Equipment; Designing and Calculating Exhaust System; Provisions for Make-Up Air; General Construction Specifications; Industrial Vacuum Cleaning Equipment: Operation, Supervision, and Maintenance of Exhaust Systems.

The committee responsible for the work is as follows: chairman, J. R. Allan, International Harvester Co., Chicago; R. J. Aldrich, Sloan Valve Co., Chicago; F. H. Amos, International Harvester Co., Chicago; C. P. Guion, W. W. Sly Mfg. Co., Chicago; E. E. Birkland, Crane Co., Chicago; Carl F. Larsson, Midwest Air Filters, Inc., Chicago; S. McMullan, Western Electric Co., Cicero, Ill.; J. G. Liskow, Claude B. Schneible Co., Chicago; Nathan Lesser, Deere & Co., Moline, Ill.; R. W. McCandlish, Research Corp., Chicago; John F. Tobin, American Blower Corp., Chicago; secretary, E. O. Jones, American Foundrymen's association, Chicago; conferees, G. A. Kluge, Central Blow Pipe Co., Chicago, J. M. DallaValle, United States Public Health service, Washington, L. C. Stokes, Department of Labor, State of Illinois, Chicago, C. S. Anderson, Belle City Malleable Iron Co., Racine, Wis., L. S. Peregoy, Sivyer Steel Casting Co., Milwaukee, J. O. Houze, National Malleable & Steel Casting Co., Cicero, Ill.

## Handles Equipment

Constructors Supply Co. Inc., Durham, N. C., has been made agent in that state to handle excavators, hoists and welders of the Harnischfeger Corp., Milwaukee. North Carolina Equipment Co., Raleigh, N. C., also will handle hoists and welders of the Harnischfeger Corp.

## Lead Poisoning

Division of industrial hygiene, New York State Department of Labor, Albany, N. Y., has published a 70-page bulletin entitled, "Lead Poisoning in Industry and Its Prevention," by May R. Mayers and Minnie M. McMahon. Copies of the bulletin may be secured for 45 cents each.

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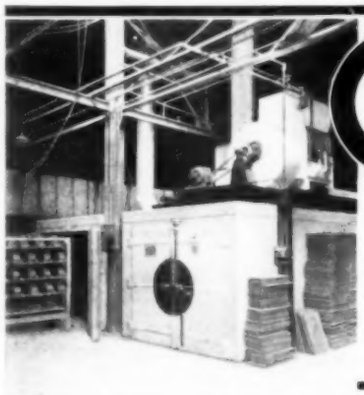

COLEMAN RACK TYPE OVENS WITH COLEMAN AIR HEATER AT NATIONAL BRONZE & ALUMINUM CASTINGS CO., CLEVELAND, O.

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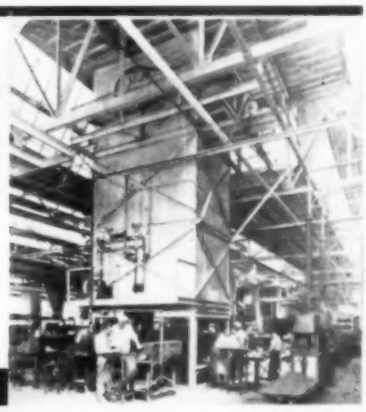


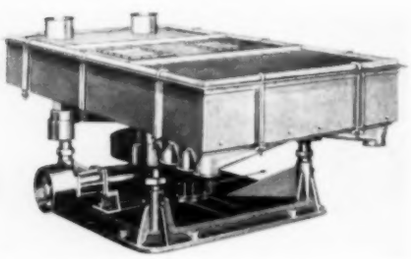
ONE OF A BATTERY OF COLEMAN TOWER OVENS AT THE BENDIX PRODUCTS CORP., SOUTH BEND, IND.

# NEW EQUIPMENT and SUPPLIES

## Sifting Motion

Elimination of screen dead spots, larger capacity, accurate screening and lower operating costs are claims set up for a new type screening device shown in the accompanying illustration and made by Sprout, Waldron & Co., Inc., Muncy, Pa. If necessary the screen box may be divided, permitting two products to be sieved at the same time. The machine is mounted on a cast iron base.

A 2-inch diameter steel hardened ball in case hardened socket is



**Sifter is given a circular motion through raceways at the four corners**

mounted on a pedestal at each of the four corners. This ball rolls on sixty five ⅜-inch diameter steel balls in the socket. On the steel frame at the same four points there is a race way with a groove to control the throw or motion of the box 2½ inches. Besides supporting the weight of the box in motion and at rest, this raceway also confines the movement to an absolute circle thus assuring an even spread of material over entire sieve area. Motion is imparted to the box through a pinion drive between the base and the box. This right angle gear drive is a well known make of ring and pinion gear similar to that in the rear of the automobile. The gears operate in an oil bath and the unit contains antifriction bearings and thrust bearings to carry weight of the drive. All bearings are over size to insure long continuous service.

## Sandblast Hose

B. F. Goodrich Co., Akron, O., recently has developed a sandblast hose designed to overcome accumulation of static electricity and damage to the hose. While the new hose does not eliminate static, it is claimed that it does provide a ground wire in the heart of the hose wall. Discharges of static tend to ground through the wire instead of through the body of the operator. Static punctures, instead of penetrating entirely through the hose wall, reach only as far as the wire, permitting the hose to continue in service with little damage.

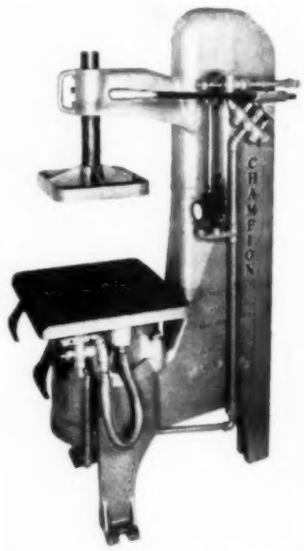
## Scale Truck

Yale & Towne Mfg. Co., 4530 Tacony street, Philadelphia, recently has placed on the market a new scale truck. Capacity of the beam scale is 1000 pounds but greater capacities are available. The manufacturers claim that the lift is so designed that a single stroke suffices to raise the load.

The truck has wheels equipped with ball bearings and rubber tires designed for easier pulling and for protection of the scale mechanism from jars. Frame height ranges from 7 to 12 inches. The unit is used for weighing small machined parts in light machinery plants.

## Molding Machine

Champion Foundry & Machine Co., 3018 West Twenty-first place, Chicago, has introduced a jolt squeezer molding machine with a safety device which protects both the squeeze and the jolt operations. The device is a valve arrangement which automatically closes the air line to either operating valve unless the squeeze head is in the proper




**Valve arrangement automatically closes the air line unless squeeze head is in proper position**

position for either operation. To operate the squeeze, the molder brings the squeeze head forward to the proper position with one hand and operates the squeeze valve with the other. If he should release his grip on the squeeze head the air line

(*Continued on page* 96)

# Write For the New Bulletin on the Willsea Thermo Siphon System.... the first step toward Better Cores and Molds at Lowest Cost.

## WILLSEA WORKS

*Foundrymen Since 1840*

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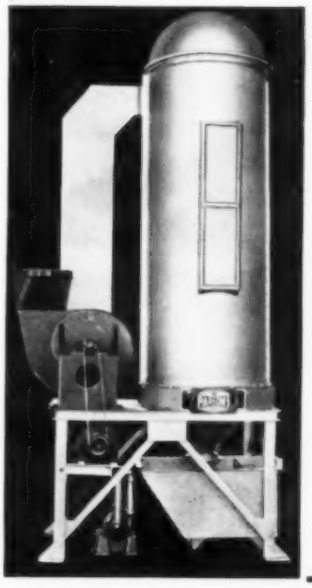
## PARSONS DUST Control

WET or DRY SYSTEMS

*New Roto-Wash Collector.*



This wet type dust collector is a most fitting partner for the time-proven Parsons Oval Bag dust arrestor.
It uses three distinct methods of mixing the dust-laden air with water—and does a thorough job of ventilating shakeouts and other equipment in the cleaning room.

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*Write for Bulletins*

**PARSONS**
**Engineering Corp.**
**Cleveland, Ohio**

(*Continued from page* 94)

automatically closes. Both hands must be occupied to operate the squeeze.

However, in the jolting operation, when both hands should be free to distribute the sand evenly in the flask, the head is brought back clear of the table which opens the air line to the jolt cylinder. The head is held in this position by a friction device or catch, allowing both hands to be free, for the jolt valve is operated by the knee. The overhead squeeze valve, located on the column, allows the molder to stand in a natural position through all operations.

## Tablet Dispenser

International Salt Co., Scranton, Pa., recently has put on the market a convenient molded plastic salt tablet dispenser. Such a dispenser

**Label on the tablet dispenser gives directions and dosage**

makes it possible to distribute tablets at all drinking water locations where workers will use them. It is held in place by a bracket, and the top unscrews for filling and screws tightly shut to protect tablets from outside contamination. A label on the dispenser gives easily read information on directions for taking the tablets. The tablets themselves are sold in cartons containing approximately 1000.

## Respirators

Mine Safety Appliances Co., Pittsburgh, has designed a chemical cartridge respirator for protection against harmful gases and vapors given off by the liquid vehicle of paint during paint spraying operations, as well as light concentrations of organic and acid gases occurring singly or in combinations. Chemical absorbents are packed in all-metal cartridges; the entire unit screws into the cartridge holders and can be renewed easily. Masks permit the wearing of goggles, and may be cleaned or sterilized whenever desired.

## Motor Drive

South Bend Lathe Works, South Bend, Ind., recently has announced an improved pedestal type of motor drive. A double arm adjustable tension brace locks the pedestal motor

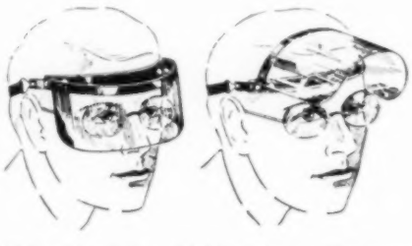
**Mounting of motor and driving mechanism on pedestal is claimed to relieve lathe of strain**

drive unit rigidly in position when the lathe is in operation, as is shown in the accompanying illustration. Two turnbuckles, one on each arm, permit adjusting the cone pulley belt for any desired pulling power, and taking up belt stretch. Pulling a lever forward unlocks the tension brace, permitting the pedestal to tilt forward and releasing the belt tension. This is said to permit easy shifting of the cone pulley belt from one step of the pulley to another.

The mounting of motor and driving mechanism on the pedestal is claimed to relieve the lathe of all strain. Power is transmitted from the motor to the countershaft by V-belts, and from the countershaft to the lathe spindle by flat leather belt.

## Eye Shield

A new eye shield, introduced by the Jackson Electrode Holder Co., Detroit, has been designed to protect workmen engaged in soldering, flash, gun and spot welding, and chipping operations, and for welders' helpers and other workmen in jobs where there is the hazard of flying particles. It consists of a flexible, transparent, noninflammable visor adjustably hinged to a light headgear. No part of it rests on the nose or ears; it does not interfere with the mechanic's eye glasses. The head band is equipped with a removable sweat band. It is claimed that ample ventilation is provided to prevent fogging, and that hot metal will roll off the visor without marking it.



**No part of the shield rests on the nose or ears, and it does not interfere with the mechanic's eye glasses**

## Hardness Tester

A direct reading hardness tester being introduced by the Detroit Testing Machine Co., 5137 Trumbull

**All piping and operating valves are contained within the body of the machine**

avenue, Detroit, presents much the same general appearance as previous machines marketed by the company but the interior mechanism is said to be entirely different. The piston is of the ground, packless, self-guided type, and the operating mechanism eliminates the use of a piston return spring.

There is no exposed piping, for this, together with operating valves, is contained within the body of the machine and all overflow is directly back into the reservoir. Work screw and screw support may be locked rigidly to prevent shake and wear; the top of the base, directly under the test ball, is machined to provide footing for special fixtures. Such fixtures may be interchangeable.

The motor driven pump is of the rotary gear type. Parts are hardened and ground and the shaft is ball bearing mounted. Ordinarily a standard 1/3-horsepower, 120-volt, 1725-revolutions-per-minute motor is supplied, but since the drive is direct by a flexible coupling it is possible to substitute another motor. The operating valve is directly connected to a foot treadle, thus freeing the operator's hands.

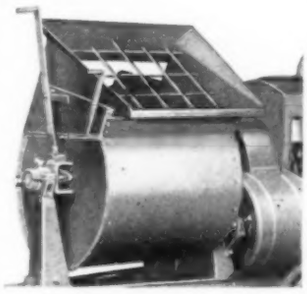
# BETTER CORES WITH A CMC MIXER!

## A MODERN MIXER AT A LOW PRICE!

Mixes and remixes materials thoroughly with heavy steel adjustable mixing shovels. Does not destroy properties of sand. Fast action cuts your mixing costs. Built to stand continuous foundry service with heavy high carbon steel shaft and self-aligning bearings.

### ELECTRIC OR LINE SHAFT DRIVEN

Built in two sizes—No. 6 with mixed capacity of 5 to 8 cu. ft., and No. 10 with mixed capacity of 10 to 14 cu. ft. WRITE for complete information and prices on a money - saving CMC Mixer.



**CONSTRUCTION MACHINERY CO.**
Waterloo, Iowa



# The Modern Electric Hoist

Anti-Friction Bearings Throughout

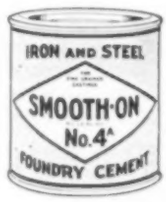
Write for Bulletin No. 126

THE NEW LIFT ABOUT

**SHEPARD NILES CRANE & HOIST CORP.**
360 SCHUYLER AVENUE, MONTOUR FALLS, N. Y.
A COMPLETE LINE OF CRANES AND HOISTS

*"Good work boys. We haven't lost an important casting since you started using SMOOTH-ON"*

SURFACE pits on only a few castings subject your entire output to criticism. Therefore—send out every casting *with the very best surface you can give it.*




Sand holes, blow holes and slight depressions at unimportant locations harm nothing but appearances. To scrap an otherwise good casting or risk complaint for so slight a fault is the height of folly.

Smooth-On No. 4 applied to each blemish as a putty, and left to harden (in 1 to 2 hours) will produce a genuine metallized iron filling that has the contour, texture and color of the surrounding metal and all the essentials of an originally perfect surface.

Such use of Smooth-On within proper bounds is certainly a legitimate and very real help in maintaining maximum salable production—and the cost of all Smooth-On that you need in a whole year is often repaid in reclaiming single casting.

What you can find out by making a trial will be more convincing than anything we say and the trial involves no effort or loss.

Smooth-On No. 4 is made in three compositions, to offer a choice of color, lustre and texture for any iron or steel casting.

**Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish.**

**Smooth-On No. 4A. For medium gray castings. A fine-grained cement that has a good metallic lustre.**

**Smooth-On No. 4B. For dark gray castings. A cement of coarser grain and darker shade.**

**FREE** HARDENED and WORKING **SAMPLES**

***Smooth-On Nos. 4AA, 4A and 4B is packed in 1-lb. and 5-lb. can, 25-lb. pail or 100-lb. keg. Mail coupon for prices and free hardened and working samples.***

Smooth-On Mfg. Co., Dept. 17,
570 Communipaw Ave., Jersey City, N. J.

Please send samples of ☐ Smooth-On No. 4AA ☐ Smooth-On No. 4A ☐ Smooth-On No. 4B

Name.....

Address.....

10-38

*Do it with* **SMOOTH-ON**

## Rotary Files

Grobet File Corp. of America, 3 Park place, New York, recently has placed on the market a line of rotary files consisting of hand cut rotary files; hand cut rotary rasps; milled cut files for drill presses; milled cut files. These files are made either in high speed steel or chrome steel.

## Sintering Testers

Harry W. Dietert Co., Detroit, has announced that the A. F. A. sintering tester is now equipped with the

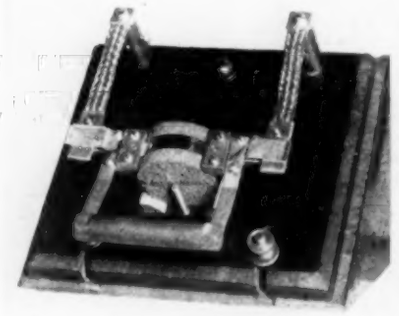


**Fig. 1—Platinum ribbon holder is located inside the cabinet of the sintering tester**

Pyro pyrometer used in many foundries for measuring the temperature of molten metal. Tester also may be provided without pyrometer for use with existing equipment.

Fig. 1 shows the platinum ribbon holder which is located inside the cabinet of the sintering tester. The pyrometer is used to measure the temperature of the ribbon which lies on the specimen of sand to be tested. The temperature of the ribbon is controlled by the rheostat of the tester. The temperature which causes the sand to burn on the ribbon is recorded as the sintering point. This temperature corresponds to the temperature at which the sand will burn on to a casting in a mold.

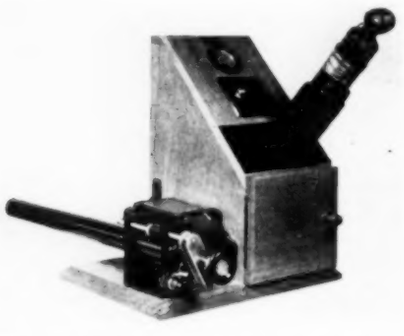


**Fig. 2—Pyrometer is used to measure the temperature of the ribbon which lies on the specimen to be tested**

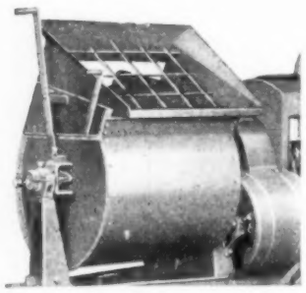
The tester is also used for measuring the refractoriness of ceramic materials such as ladle linings and fire bricks. The temperature range of the sintering tester is from 1800 to 3800 degrees Fahr.

## Gaskets

Johns-Manville Co., 22 East 40th street, New York, has developed a new type of gasket constructed of pre-formed plies of asbestos and cold-rolled, cadmium-plated steel for sealing boiler manholes, handholes and tube plates. The materials are spirally wound in such a manner that the asbestos serves to seat the adjacent, interlocking metal plies. As soon as compression is encountered, the edges of the plies meet the bearing surfaces of the manhole, handhole or tube plate to form a series of metal barriers that provide an effective seal.

## Sand Mixers

Construction Machinery Co., Waterloo, Iowa, has placed on the market a new core sand mixer. The mixer has heavy steel adjustable mixing shovels which mix and remix the materials. It has an abrasion-



**Heavy steel mixing shovels mix and remix the core sand**

resisting steel shell, high carbon steel shaft and self-aligning bearings. Mixer is available with gasoline engine, electric motor, or equipped for line shaft drive.

## Pyrometer

Pyrometer Instrument Co., 103 Lafayette street, New York has announced a line of straight and flexible immersion pyrometers for nonferrous metals with interchangeable thermocouples of various lengths. These are either of the bare or protected type, and are interchangeable.

A correction screw on the face of the instrument is said to make possible perfect calibration at all times. A clamping device is embodied in the indicator. This fixes the indicating needle at the correct temperature indication, which may be read and checked after withdrawal. A second pressure on the

**A clamping device on the housing of the indicator fixes the indicating needle at the correct temperature reading**

red button of the housing device returns the needle to its zero setting. This locking device also is designed to protect the instrument from damage while being carried or in transit.

## Sand Conditioner

Jeffrey Mfg. Co., Columbus, O., has announced a new semiportable foundry sand conditioner with a capacity up to 45 tons per hour. This machine is designed for grab-bucket feeding. Continuous screening is provided by a positive eccentric type screen, which discharges refuse to one side. Conditioning is accomplished by a pair of heat-treated reversible cutter bars, which throw the conditioned sand into piles ready for reuse.

The conditioner has a rigid frame, a 5000-pound capacity hopper and is provided with grapple eyes for transport by crane. Its power unit is a 7½-horsepower fan-cooled engine, equipped with push-button control and V-belt drives.

**Semiportable sand conditioner has capacity up to 45 tons per hour**

*"Here's another 100 lbs. of*

# PROFIT"

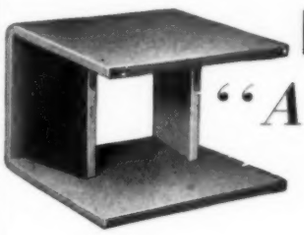
That's how users of **"CERTIFIED"** Steel Abrasives feel about Angular Steel Grit and Sansom Steel Shot. They know from fifty years of faultless experience that **"CERTIFIED"** is the hardest, sharpest, longest lasting abrasive ever made. Some have tried the so-called "cheaper" abrasives from time to time, but these "cheaper" abrasives always total much more in the final summing up! So they come back to **"CERTIFIED"**. And **"CERTIFIED"** Blast Cleaning Grit and Shot gives them **PROFIT** in every bag!

## PITTSBURGH CRUSHED STEEL CO.

PITTSBURGH, PENNA.

## STEEL SHOT AND GRIT CO.

BOSTON, MASS.



## MILWAUKEE *"ANGLE"* CHAPLETS

"MEET" the new addition to our line, and a fit companion to the famous MILWAUKEE THREAD STEM Single and Double Head Chaplets.

"Use" MILWAUKEE 'ANGLE' CHAPLETS—they are indispensable for some jobs. Write for prices and information. Also test our unequaled service.

**MILWAUKEE CHAPLET & MFG. CO.**

1023 So. 40th St., Milwaukee, Wis.

*Manufacturers of Foundry Chaplets, Galvanized Riddles, Kordo Core Paste, Tripolex and Non Silica Partings*

## ENGINEERING SERVICE

Well rounded organization of *technical and practical foundry engineers*, and architects completely equipped to handle any problems in designing, building or operating a foundry.

Specializing in planning, and equipping new plants, redesigning existing plants, and advising on methods of decreasing costs and increasing production.

**CONOVER ENGINEERING CO.**

O. D. CONOVER

*Consulting Engineer*

MAIN 8772

1740 East 12th St. Cleveland, Ohio

# FOUNDRY ACTIVITIES

INCREASED business has required installation of additional equipment and hiring of more men by the Kendallville Foundry Co., Kendallville, Ind. The company is now operating on a 40-hour week.

* * *

Farrel-Birmingham Co., Inc., Ansonia, Conn., is building 4000 square feet of additional foundry space at its plant. The new equipment to be installed includes a 15-ton traveling crane, a large molding machine and sand handling system.

* * *

More than 2000 employes and their families attended the annual picnic of the American Steel Foundries, Alliance, O., Aug. 27, at Lake Brady Park, O.

* * *

Utility Steel Foundry, 3334 East Slauson avenue, Los Angeles, has secured a building permit for the construction of a foundry building. Contract has been awarded to the National Tank & Mfg. Co., 820 Santa Fe avenue, Los Angeles.

* * *

Tigerloys, team of Massillon Steel Casting Co., Massillon, O., recently defeated the Fort Pitt Bridges, 12-1, to win the Y.M.C.A. industrial softball league championship.

* * *

American Steel Castings Co., Jersey City, N. J., has incorporated with 10,000 shares no par stock; agent, the Corporation Trust Co., Jersey City.

* * *

American Steel Foundry Co., Hammond, Ind., is preparing to expand its plant by construction of four or five buildings and installation of equipment; obsolete buildings to be wrecked.

* * *

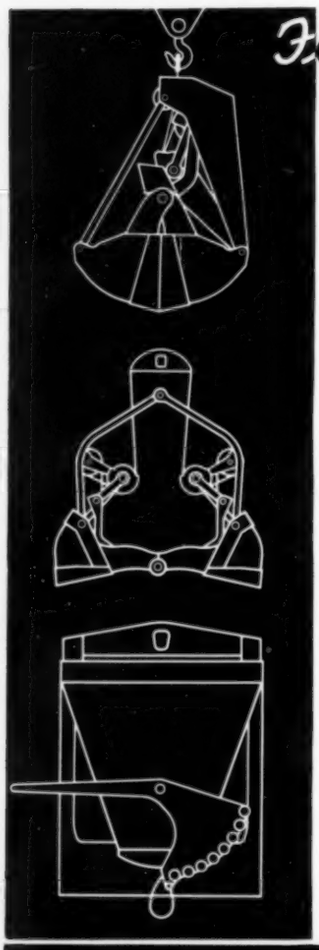
Columbia Foundries Inc., Columbia City, Ind., recently has been reorganized and will be known under the same name. B. O. Fink is president and Ralph F. Gates is resident agent.

* * *

Peru Foundry Co., Peru, Ind., recently installed a new electric furnace with a capacity for loading,

(*Concluded on page* 102)


BLAW-KNOX
BUCKETS
*For Foundry Service*



The popular hook-on bucket for handling sand, coke, coal, etc. Adaptable to a broad range of service and multiplying the value of your crane investment.

A Hook-on type of bucket built especially to meet the requirement of extremely limited head room clearance for operation.

The roller gate dump bucket presenting the first practical means of obtaining controllable discharge for delivering sand to floor or flasks, etc.

ADDRESS INQUIRIES TO

BLAW-KNOX DIVISION
★ OF BLAW-KNOX COMPANY ★
2097 Farmers Bank Building • Pittsburgh, Pa.


**RAW MATERIAL PRICES**
**Sept. 23, 1938**

| | |
|---|---|
| **Iron** | |
| No. 2 foundry, Valley | $20.00 |
| No. 2 Southern Birmingham | 16.00 |
| No. 2 foundry, Chicago | 20.00 |
| No. 2 foundry, Buffalo | 20.00 |
| Basic, Buffalo | 19.00 |
| Basic, Valley | 19.50 |
| Malleable, Chicago | 20.00 |
| Malleable, Buffalo | 20.50 |
| Charcoal iron, furnace | 25.00 |
| **Coke** | |
| Connellsville beehive premium | $5.75 to $6.25 |
| Wise county beehive coke | 5.50 to 6.50 |
| Detroit by-product delivered | 10.25 |
| **Scrap** | |
| Heavy melting steel, Valley, No. 2 | $12.50 to $13.00 |
| Heavy melting steel, Pittsburgh, No. 2 | 14.00 to 14.50 |
| Heavy melting steel, Chicago, No. 2 | 10.50 to 11.00 |
| Stove plate, Buffalo | 13.00 to 13.50 |
| Stove plate, Chicago | 9.00 to 9.50 |
| No. 1 cast, New York | 12.00 to 12.50 |
| No. 1 cast, mchy., Chicago | 13.00 to 13.50 |
| No. 1 cast, Pittsburgh | 15.00 to 15.50 |
| No. 1 cast, Philadelphia | 16.50 to 17.00 |
| No. 1 cast, Birmingham | 14.00 to 14.50 |
| Car wheels, iron, Pittsburgh | 15.00 to 15.50 |
| Car wheels, iron, Chicago | 14.50 to 15.00 |
| Railroad malleable, Chicago | 15.50 to 16.00 |
| Malleable, Buffalo | 13.50 to 14.00 |
| **Nonferrous Metals** | **Cents per pound** |
| Castings copper, refinery | 9.90 |
| Straits tin | 43.35 |
| Aluminum, 99 per cent | 20.00 |
| Aluminum, No. 12 (Secondary, standard) | 13.75 to 14.25 |
| Lead, New York | 5.10 |
| Antimony, New York | 11.25 |
| Nickel, electro | 35.00 |
| Zinc, East St. Louis, Ill. | 4.95 |

# Be Sure Your AIR Is Right!

As every foundryman knows, scrap losses run too high and you waste coke when air delivered to cupola isn't accurately and easily controlled.

The key to worthwhile savings is the Roots-Connersville Rotary Positive Blower, which, with its simple control, either manual or automatic, delivers exactly the right amount of air to the cupola.

**Roots CONNERSVILLE BLOWER CORP.**
**CONNERSVILLE, IND.**

ESTABLISHED 1788
*one hundred and fiftieth anniversary*

**THE E. & G. BROOKE IRON COMPANY**

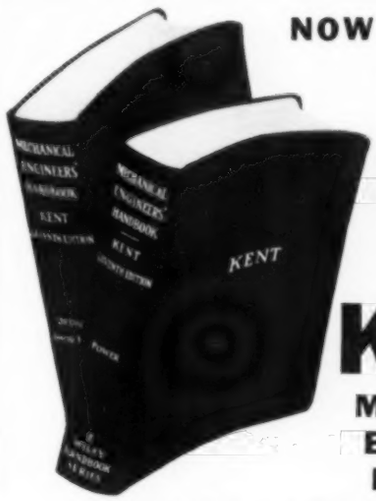
◆

*Manufacturers of*
**Basic, Malleable, Foundry, Forge and Low Phosphorus Pig Iron**

◆

**BIRDSBORO, PENNSYLVANIA**

**NOW COMPLETE**




*in two independent, inclusive volumes, obtainable separately or in combination*

**KENT MECHANICAL ENGINEERS' HANDBOOK**

ROBERT T. KENT, Editor-in-Chief
*with the collaboration of 71 specialists*

*ELEVENTH EDITION*

For over four decades "Kent" has been known the world over as the "Engineers' Bible." For all-around utility, engineers have long looked upon it as the one indispensable reference volume for constant everyday use. And now, in 1938, with the publication of the eleventh edition, "Kent" surpasses all previous editions in completeness, authoritativeness, up-to-dateness, and usefulness. As one engineer expresses it, "It is the high-water mark in handbooks." If you would keep abreast of the rapidly-moving progress in your field, be sure to order a set of the NEW KENT.

*Send for a set on ten days' approval*

POWER VOLUME: 1252 pages, $5.00
DESIGN-SHOP PRACTICE VOLUME: 1378 pages, $5.00
JOHN WILEY & SONS, Inc., NEW YORK, N. Y.

(*Concluded from page* 100)

melting and pouring 1000 pounds of iron per hour. It is being used in connection with the cupola, although another electric unit may be installed next year.

* * *

Index of foundry equipment orders for August, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 83.3 as compared with 74.2 in July and 257.5 in August, 1937. Index of shipments was 89.1 as compared with 105.8 in July and 351.1 in August of last year.

* * *

Sale of the foundry department of the former Anderson Engine & Foundry Co., Anderson, Ind., to the Lynch Corp., Anderson, Ind., has been reported by the Michael Tauber Co., Chicago, recent purchasers of the property at a receiver's sale. Lynch Corp. officials said they would continue to operate the foundry with a force of approximately 40 men engaged in the manufacture of glass bottle molds.

* * *

White Machine Works, 750 Wisconsin street, Eau Claire, Wis., has begun construction of an addition to its foundry which will double present capacity; new equipment will be installed in old plant and in addition. Extension is 48 x 52 x 11 feet and will cost about $5000 for the building alone.

* * *

Straight Line Engine Co., Syracuse, N. Y., founded in 1880 and the Direct Separator Co., Syracuse, founded in 1894 have been merged to form the Straight Line Foundry & Machine Corp. The business of each will continue as before under the Straight Line division and the Direct Separator division respectively of the new corporation.

# NEW TRADE PUBLICATIONS

**Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland**

SAFETY SHOES—"Stop Foot Injuries" is the title of a 32-page booklet recently issued by the Lehigh Safety Shoe Co., Allentown, Pa. The booklet lists the frequency of foot injuries in many industries and describes the construction and tests of the company's safety shoes. Many photographs of shoes that have been in service illustrate their strength and usefulness.

ELEVATOR ROPE—Broderick & Bascom Rope Co., St. Louis, has published a 32-page catalog of its wire ropes for elevators. Dimensions and prices are included.

SNAGGING WHEELS — Abrasive Co., Tacony and Fraley streets, Philadelphia, recently has issued a 6-page bulletin describing its flanged snagging and billet grinding wheels.

CUPOLA CONTROL—Edwin S. Carman Inc., 1643 Lee road, Cleveland, has issued a bulletin describing its advisory and consulting services for foundries.

CONVEYORS — Johns Conveyor Corp., 251 Ogden street, Newark, N. J., has issued a 4-page leaflet describing the basic principles underlying the construction of its moving rubber pipe lines for solid materials.

BRIQUETS — Electro Metallurgical Co., 30 East Forty-second street, New York, has published a 20-page booklet entitled "Briquetted Alloys for the Cast Iron Foundry." The booklet describes the use of silicon, manganese, and chromium briquets, and contains several pages of information on briquet melting practice and typical mixtures for cupola use.

PLASTIC REFRACTORIES — Ironton Fire Brick Co., Ironton, O., has issued a bulletin describing its plastic firebrick for boiler settings and furnace and ladle linings. Uses and applications are fully illustrated.

FIRE BRICK — Laclede-Christy Clay Products Co., St. Louis, has issued a 12-page leaflet describing the fabrication and uses of its monolithic furnace fire brick. The leaflet is illustrated with photographs and detailed drawings.

MATERIAL HANDLING — A recent publication of the Broderick & Bascom Rope Co., Pittsburgh, announces its purchase of the Murray Safety Sling Co. Inc., Pittsburgh, and describes the line of plaited safety slings it now manufactures.

HOOK BOLTS — Fanner Mfg. Co., Brookside park, Cleveland, has issued a 4-page leaflet on its hook bolt head and deep washer. The leaflet is illustrated with photographs and sketches of head and washer in use on a variety of construction jobs.

FLAME CUTTING — Compressed Industrial Gases, Inc., 221 North La Salle street, Chicago, has issued a 4-page leaflet describing and illustrating its new flame cutting machine for use in the automatic, mechanical flame cutting of shapes from plates and billets.

MATERIAL HANDLING — Chain Belt Co., 1600 West Bruce street, Milwaukee, has issued bulletin No. 318 on its sand conditioning and mold conveying equipment. This 16-page leaflet is illustrated with photographs of installations now in use.

VALVES—Homestead Valve Mfg. Co., Coraopolis, Pa., has recently issued reference book No. 38, which supersedes all previous issues and describes its standard sizes and types of valves. Dimensions, weights and prices are included in this 48-page catalog.

ELECTRIC MOTORS — Burke Electric Co., Erie, Pa., has issued a leaflet illustrating and describing its line of polyphase one to 1500 horsepower induction motors. The leaflet includes many details of construction and cross section drawings of the motors.

CORE OVEN CONTROL — Wilsea Works, 1042 University avenue, Rochester, N. Y., has issued a 4-page leaflet describing the operation of its thermo siphon systems. Control of core baking operations is explained, and savings resulting from applications of the equipment are listed.

TEMPERATURE CONTROL — Brown Instrument Co., Philadelphia, has published a new folder on air-operated controllers. Adaptability of the equipment to varied control requirements of industrial processing is stressed in a list of 50 representative applications. Several installations are illustrated.

NICKEL — "A Versatile Automotive Metal" is the title of an article by H. E. Blank, Jr., reprinted by the International Nickel Co., 67 Wall street, New York. The article describes the many uses that have been made of nickel alloys and nickel plating.

ROLLER CONVEYORS — Palmer-Bee Co., Westminsted and S. T. R. R., Detroit, has issued a catalog describing its complete line of rolled conveyors, sheet metal spirals, slides and chutes. The catalog is illustrated with tables, diagrams and many pictures of equipment installations.

REFRACTORIES — Quigley Co. Inc., New York, has published bulletin No. 327-B describing its refractory lagging for high temperature equipment. This 8-page leaflet also lists other products manufactured by the company for insulating and protecting furnaces and other industrial equipment.

GRINDING MACHINES—Norton Co., Worcester, Mass., recently has issued two 16-page booklets. The first describes its roll grinding machines with traversing work tables; the second illustrates its multipurpose hydraulic universal grinding machines. Both booklets are well illustrated with photographs of the machines, and specifications are given in tabular form.

ELECTRIC MOTORS — Allis-Chalmers Mfg. Co., Milwaukee, has issued bulletins No. 1156A and No. 1165A which

(*Concluded on page* 104)

## SPECIMEN POLISHING AT L-O-W SPEEDS . . .

AB

•Recent findings in research bring to view specific advantages in polishing metallographic specimens at low speeds. The A-B Low Speed Polisher shown above meets the requirements of those who want these advantages in this phase of specimen preparation. It is a highly efficient and sturdily built equipment and embodies desirable use-conveniences.

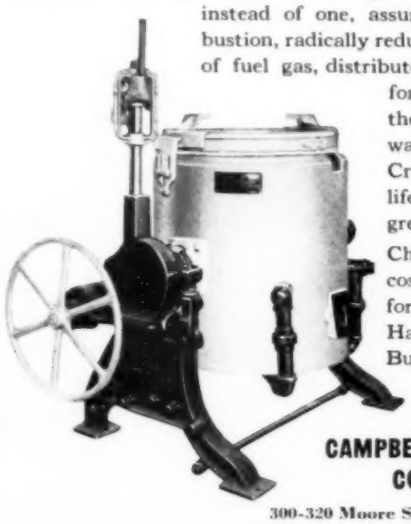
The 1938 "METAL ANALYST" having many NEW items is in preparation. Shall we reserve a copy for you?

CUTTERS AND GRINDERS — SPECIMEN MOUNT PRESSES
STRAIGHT LINE GRINDERS — TRANSOPTIC MOUNTINGS
PAPER DISC GRINDERS — SPECIMEN STORAGE CABINETS
HIGH SPEED POLISHERS — POLISHING STANDS
MICROSCOPES OF EVERY DESCRIPTION

**Adolph I. Buehler**
OPTICAL INSTRUMENTS • METALLURGICAL APPARATUS
228 NORTH LA SALLE ST. • • CHICAGO ILL.

## HAUSFELD
### MULTIPLE BURNER
*Gas Fired*
### CRUCIBLE FURNACES
**Reduce Every Item of Melting Expense**

Patent claims have been allowed on the basic principles of the new Hausfeld Multipe Burner Metal Melting Furnaces. The gas flame, entering at four openings instead of one, assures perfect combustion, radically reduces consumption of fuel gas, distributes the heat uniformly throughout the unit and is always under control. Crucible life and life of linings is greatly increased.



Check your melting costs. Then send for our data on the Hausfeld Multiple Burner Furnace.

**THE CAMPBELL HAUSFELD COMPANY**
300-320 Moore St., Harrison, Ohio

## ECONOMICAL SAND TESTING SET

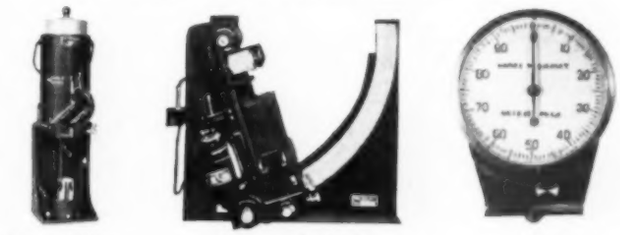
**Moisture—Permeability—Green and Dry Stength**
**Price—$235.50 to $310.50**

### MOISTURE TEST

*Balance* — *Moisture Teller* — *Sand Rammer*

Moisture Testing with the Moisture Teller is the practical way for either shop or laboratory tests.

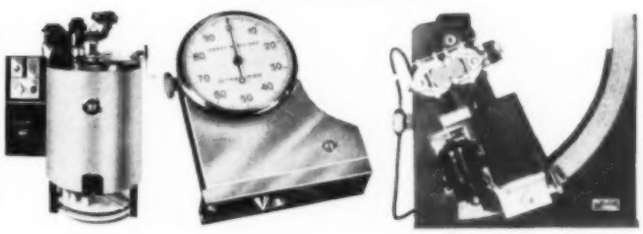
### PERMEABILITY — STRENGTH — MOLD HARDNESS TEST



*Permeability Meter* — *Universal Sand Strength Machine* — *Mold Hardness*

Control molding sand and molds to secure better castings at a lower cost.

### CORE TEST



*Core Test Oven* — *Core Hardness* — *Tensile Core Strength*

Measure the properties of cores to improve core room operation and reduce cost.

### COMMERCIAL SAND TESTING

Our laboratories solicits test work on foundry sands, bonding clays, core binders and facing materials.

*Write to us for*
SAND TESTING — MICROSCOPE — SPECTROGRAPH
QUICK CARBON DETERMINATOR — QUICK SULPHUR DETERMINATOR

**HARRY W. DIETERT CO.**
9330 Roselawn Ave.
DETROIT, MICH.

(*Concluded from page* 102)

illustrate and describe both large polyphase induction motors and bracket bearing synchronous motors. Both bulletins include full descriptions of construction, applications and special assemblies.

DIESEL ENGINES—A new 36-page booklet, illustrating various installations of diesel and gas engines, has been recently published by Worthington Pump & Machinery Corp., Harrison, N. J. This new booklet contains nearly 100 illustrations of the engines in service and describes their range of sizes and services.

PAINT—Skybryte Co., 3125 Perkins avenue, Cleveland, has issued a new catalog which describes its line of maintenance products for metal, concrete, wood, glass and composition surfaces. Colors and applications of the company's paints are illustrated and described.

CORROSION INHIBITORS—"Chromium Chemicals as Corrosion Inhibitors" is the title of a new booklet published by the Mutual Chemical Co. of America, 270 Madison avenue, New York. The booklet discusses application of chromates to corrosion problems of petroleum, chemical and general plant maintenance.

SEPARATORS—Stearns Magnetic Mfg. Co., Milwaukee, has issued a new bulletin No. 700, describing an induction separator for concentration of ores, minerals and other materials of high magnetic reluctance. Two new models, designed for both laboratory and commercial use, are pictured. Bulletin No. 25, issued by that company, features its line of circular, rectangular and hand magnets.

INDICATING PYROMETERS—A new 8-page bulletin issued by the Foxboro Co., Foxboro, Mass., contains descriptions of the company's indicating pyrometers of the mono-pivot type, portable indicating pyrometers, and resistance thermometer indicators. Illustrations clarify the principle of the mono-pivot movement, and show the instruments in operation.

SAND CONDITIONING — Two new catalogs on the subject of sand conditioning equipment have been published by the American Foundry Equipment Co., Mishawaka, Ind. These catalogs show photographs of mechanical features and construction details of the company's sandcutters, together with views showing their application in foundries of all kinds.

MATERIAL HANDLING—Wellman Engineering Co., Cleveland, manufacturer of material handling equipment, has issued a new bucket catalog which contains a series of individual bulletins, each describing a distinct type of bucket. Among the types represented are power-arm, multiple rope, clean-up, dredging and dragline buckets.

DIESEL ENGINES — Chicago Pneumatic Tool Co., 6 East Forty-fourth street, New York, has prepared a 20-page catalog describing its four-cycle, solid injection engines designed for continuous operation. Engines in sizes of 300 to 800 horsepower are illustrated. Details of fuel consumption, dimensions and operation are included in tabular form.

DUST CONTROL — Claude B. Schneible Co., Chicago, has issued bulletin No. 68 describing construction and application of its smaller dust collecting units. Capacities, dimensions and approximate weights of the dust collectors are given in tabular form. Another recent publication of the company is bulletin No. 110, describing construction and operation of the company's larger units. This bulletin is illustrated with photographs of recent installations and diagrams showing principles of construction.

NICKEL ALLOY STEELS — "Iron-Nickel and Related Alloys of the Invar and Elinvar Types" is the title of a recent data sheet issued by the International Nickel Co. Inc., 67 Wall street, New York. Physical properties and applications of alloys containing from 25 to 60 per cent nickel are described. The bulletin is illustrated with photographs, diagrams, and charts.

REFRACTORIES — Harbison-Walker Refractories Co., Pittsburgh, has issued an illustrated leaflet describing its line of recently developed fireclay brick. Line and bar graphs are used to show the softening points, porosity, linear contraction, thermal expansion and alumina content of the bricks. Results of panel spalling tests are reported with photographs and charts.

SAND CONDITIONING—Beardsley & Piper Co., 2541 North Keeler avenue, Chicago, has issued bulletin No. 1001 covering new developments in its line of sand mulling and conditioning machines. Complete dimensions and specifications of the four models now available are given, as are the weights, floor space requirements and operating details.

ELECTRIC UNIT HEATERS—A new bulletin, No. 38-A, has been published by the Electric Air Heater Co., division of the American Foundry Equipment Co., Mishawaka, Ind., on its line of electric unit heaters for commercial and industrial use. This bulletin describes cation of these units, with specifications and drawings. Other data also are included.

STEAM SPECIALTIES — A new booklet recently published by the International Nickel Co. Inc., 67 Wall street, New York, outlines a practical method for judging how well steam specialty equipment is made to give long service without repairs. Demands made by operating conditions upon vital parts of meters, regulators, thermometers, and other steam specialties are listed and demonstrated.

WELDING — Aluminum Co. of America, Pittsburgh, recently published a 48-page booklet entitled "Welding Aluminum." Both pressure welding, in the form of spot, butt, and seam welding, and fusion welding, in the form of torch and arc welding, are described and illustrated. Specific instructions for the welding of aluminum and its alloys are given with a brief discussion of the principles involved.

WELDING — Metal & Thermit Corp., 120 Broadway, New York, recently has issued booklets No. 18c and 3a describing the history, practice and applications of thermit welding and its line of electric welding electrodes. Several pages of booklet No. 18c are devoted to thermit for foundry use, and to the metals and alloys produced by the thermit reaction and used for alloying purposes in the manufacture of steel and nonferrous alloys.

ROLLER CHAINS—Link-Belt Co., Indianapolis, has issued data book No. 1757 on its roller chain and sprockets for drives and conveyor uses. This 174-page book includes information, application pictures and engineering data on many chains and features not hitherto announced. It covers roller chains of manufacturers' standard sizes, nonstandard sizes and heavy sizes. Multiple-width roller drive chains are also described.

PULVERIZERS—Whiting Corp., Harvey, Ill., has issued bulletin No. 15 illustrating and describing its pulverizers for fine grinding. This 50-page booklet gives general specifications, operation methods and standard specifications of all machines illustrated. The use of pulverized coal for the firing of melting furnaces and annealing ovens and the operation of pulverizers for seacoal are described in detail.

STEEL CASTINGS — "FCC Products and Services" is the title of a colorful 64-page catalog issued by the Forging & Casting Corp., Ferndale, Mich. The book contains detailed illustrations and descriptions of the company's special products, including composite steel die sections, nitri-cast iron, cast to shape tool steel, and the like. Also there are handy tables of weights, analyses, decimal equivalents, and other useful reference material.

ELECTRICAL EQUIPMENT—General Electric Co., Schenectady, N. Y., has issued bulletins No. GEA-1437C, -1542C, -2714, -1440G, -2889, -2052A and -1607B which describe gear-motors, direct current motors, wound rotor alternating current motors, arc welders, magnetic motor starting switches, track type limit switches and direct current generators and exciters. Another recent publication is a 20-page book on reconditioning of flooded electric equipment.

ELECTRICAL EQUIPMENT — General Electric Co., Schenectady, N. Y., recently issued a booklet describing alternating and direct current equipment for traveling electric cranes. Another publication describes protective panels for direct current cranes. Other recent publications cover inspecting and recording instruments, push-button stations, multispeed induction motors, combination and magnetic switches, plugs and sockets for storage battery locomotives, autotransformers and relays.

ROOFS — Complete detailed specifications on built-up roofs are contained in the new 36-page illustrated brochure recently published by Johns-Manville, 22 East Fortieth street, N. Y. An index and condensed table of specifications are listed on two pages of the booklet and various methods of base and cap flashing are outlined, together with diagrams showing installation. A complete discussion of the various types of roofing materials and their qualities is given, and the subject of roof insulation is gone into in detail.

## Faked Foundry Facts

**"Skimmers with Handles"**